United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with
Illinois Agricultural
Experiment Station

Soil Survey of Coles County, Illinois

How To Use This Soil Survey

General Soil Map

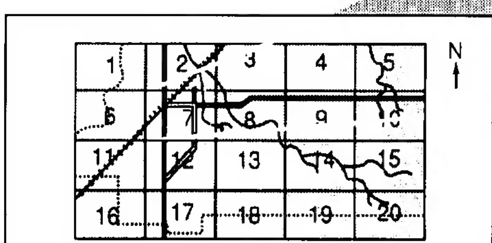
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

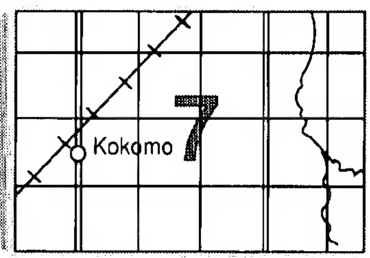
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.

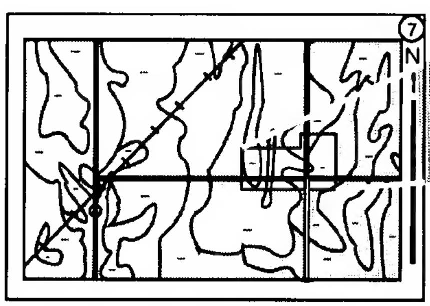


INDEX TO MAP SHEETS

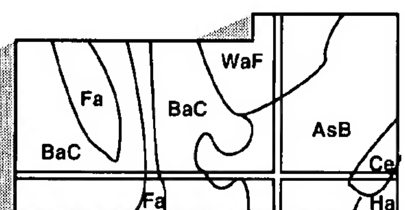


MAP SHEET

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



MAP SHEET



AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1986. Soil names and descriptions were approved in 1987. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1986. This survey was made cooperatively by the Soil Conservation Service and the Illinois Agricultural Experiment Station. It is part of the technical assistance furnished to the Coles County Soil and Water Conservation District. The cost was shared by the Coles County Board and the Illinois Department of Agriculture.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Soil Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

This soil survey is Illinois Agricultural Experiment Station Soil Report No. 138.

Cover: A system of conservation tillage that leaves crop residue on the surface helps to control erosion on the majority of the cropland in Coles County.

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Issued April 1993

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Summary of Tables

Foreword

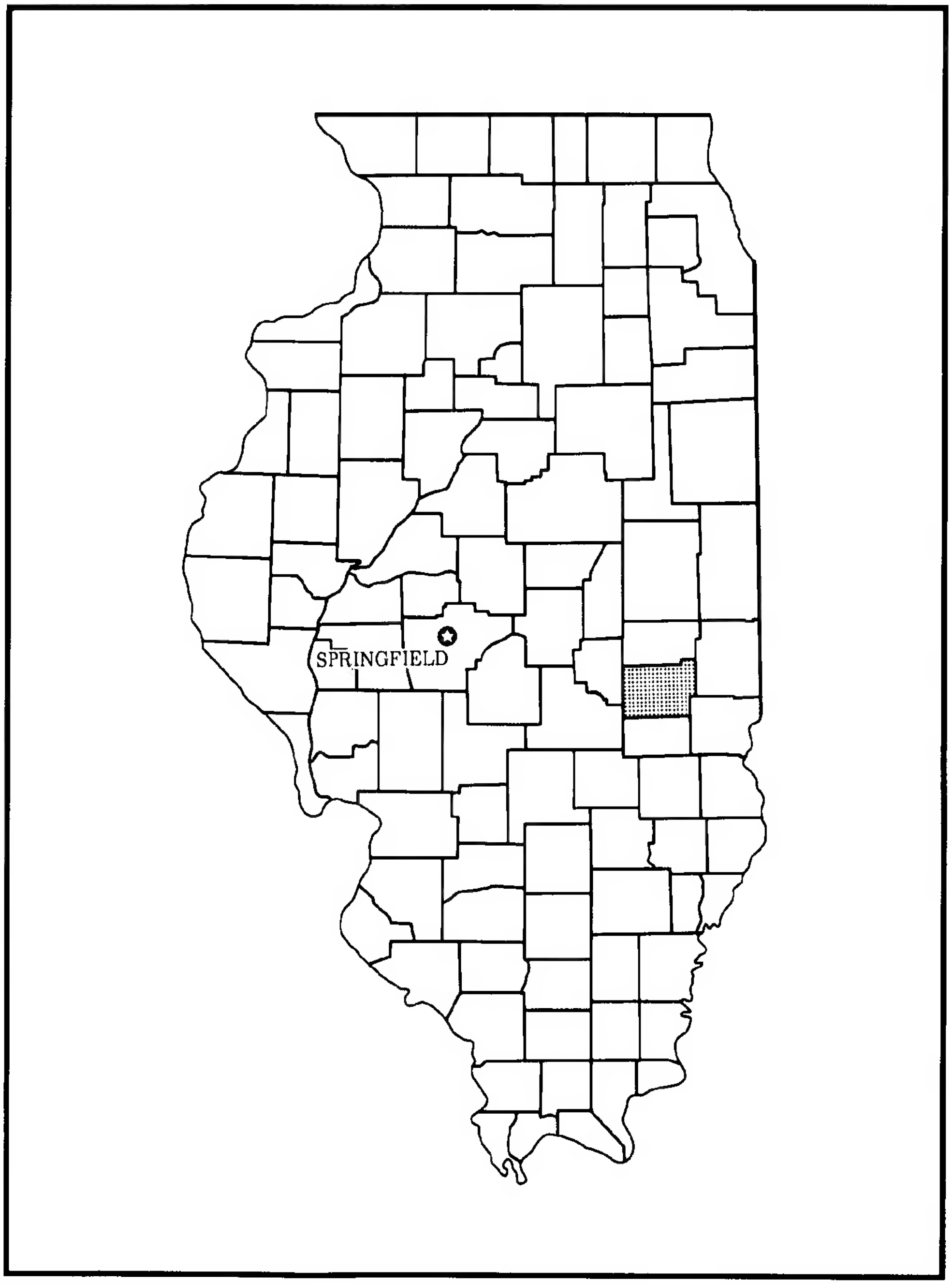
This soil survey contains information that can be used in land-planning programs in Coles County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Charles Whitmore
State Conservationist
Soil Conservation Service



Location of Coles County in Illinois.

Soil Survey of Coles County, Illinois

By Gary Hamilton

Fieldwork by Gary Hamilton, Soil Conservation Service, and Al Pasteris and Bruce Houghtby, Coles County

United States Department of Agriculture, Soil Conservation Service,
in cooperation with
Illinois Agricultural Experiment Station

COLES COUNTY is in the east-central part of Illinois. It has an area of 324,480 acres, or about 407 square miles. It is bordered on the north by Douglas County, on the east by Edgar and Clark Counties, on the south by Cumberland County, and on the west by Shelby and Moultrie Counties. In 1980, the population of the county was 52,260. Charleston, the county seat, had a population of 19,355, including students, and Mattoon had 19,055 residents.

This soil survey updates the survey of Coles County published in 1929 *(9)*. It provides additional information and larger maps, which show the soils in greater detail.

General Nature of the County

Al Pasteris, soil scientist, Coles County, helped prepare this section.

The following paragraphs provide general information about Coles County. They describe climate; historical development; transportation facilities; natural resources; and relief, physiography, and drainage.

Climate

Prepared by the Illinois State Water Survey, Champaign, Illinois.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Charleston and Mattoon in the period 1951 to 1980. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 29 degrees F and the average daily minimum temperature is 20.8 degrees. The lowest temperature on record, which occurred at Mattoon on January 17, 1977, is -19 degrees. In summer, the average temperature is 74 degrees and the average daily maximum temperature is about 85 degrees. The highest recorded temperature, which occurred at Mattoon on July 14, 1954, is 111 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 36.99 inches. Of this, 22.11 inches, or about 60 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 15.99 inches. The heaviest 1-day rainfall during the period of record was 3.95 inches.

The average seasonal snowfall is 18.7 inches. The greatest snow depth at any one time during the period of record was 12 inches. On the average, 30 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

Historical Development

The first settlers in the area that is now Coles County were John Parker and Sam Kellogg and their families. They arrived in the area in 1824 *(3)*. John Parker built the area's first log cabin, along the eastern bank of the Embarras River in Hutton Township. The early settlers were primarily farmers who settled the forested areas in the southeast and southwest corners of the county along the major streams. These areas offered more protection and, after clearing, were easier to farm than the areas of dense prairie grass sod or the large areas of marsh elsewhere in the survey area.

Coles County was officially formed in 1830. It originally included the areas that are now Douglas and Cumberland Counties. The county was named for the second governor of Illinois, Edward Coles, an abolitionist from Virginia *(3)*. Charleston is the county seat. The population of Charleston and Mattoon accounts for more than 70 percent of the county's population. Most of the industry in the county is located in these communities. More than 80 percent of the acreage in the county is used for agriculture. Eastern Illinois University and Lakeland College are also located in Coles County.

Transportation Facilities

Coles County is serviced by a sound network of roads that allows easy travel throughout the area. Included are Interstate 57; U.S. Highway 45; State Highways 16, 130, and 121; and numerous county blacktop roads. The county also has passenger and freight rail service and an airport.

Natural Resources

Soil is the major natural resource in Coles County. In 1981, approximately 70 percent of the total acreage was used for the production of corn and soybeans. About 115,000 acres of corn and 112,000 acres of soybeans were harvested *(6)*. Other agricultural products include wheat, oats, hay, cattle, hogs, and sheep.

Timber production has recently become less important to the county than in previous years. In 1982, the county had 13,903 acres of woodland *(13)*. Most of the woodland is located along the county's three larger streams and their tributaries. Most of this land is not tillable and is maintained for conservation reasons. It provides important areas of wildlife habitat.

Water is abundant within the county. A series of manmade lakes supplies water for the larger municipalities. A total of 704 acres of manmade lakes provides usable water for drinking and recreational use. Ground-water supplies are adequate to meet the needs of residents in rural areas.

Other resources in the county include sand, gravel, stone, and oil. Sand and gravel are mined from pits in the outwash plains and along the Embarras River. Limestone is also mined along the river, where it is closer to the surface than in other areas. Oil is pumped from wells in numerous locations along the western edge of the county. Bituminous coal underlies most of the county, but no reserves are accessible to surface mining methods. To date no coal has been mined in the area.

Relief, Physiography, and Drainage

Relief within Coles County is slight. It ranges from 550 feet above sea level along the Embarras River near the Coles and Cumberland county line to 781 feet above sea level south of Mattoon. Most of the differences in relief result from the low elevation of the Embarras River valley in the eastern part of the county, but most of the land area in the county is level or nearly level uplands that range from about 650 to 780 feet above sea level.

The survey area was affected by three different glacial periods. The latest of these was the Wisconsinan glaciation. Coles County represents the southernmost extent of the Wisconsinan glaciation in Illinois. The Shelbyville morainic system, in the southern part of the county, resulted from this glaciation. In the southeast and southwest corners of the county, where the glacier did not reach, meltwater from the glacier formed outwash plains containing stratified sand and gravel. As the glacier retreated from the area, it deposited mixed sands, silts, and clays, which formed till plains. These areas were then covered with a thin layer of a silt-sized windblown material called loess. In most areas the loess is less than 40 inches thick.

The county has three major watersheds. The Embarras and Little Wabash Rivers drain into the Wabash River, and the Kaskaskia River drains into the Mississippi River. These three rivers and their tributaries form a dendritic stream pattern throughout the county. This pattern is very common in nearly level areas.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and

management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral

patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Descriptions

1. Drummer-Flanagan Association

Nearly level, poorly drained and somewhat poorly drained, silty soils formed in loess and glacial till or in loess and glacial outwash; on till plains

This association is characterized by low ridges and flat areas. The soils on the ridges have slopes that are 100 to 800 feet long. The low areas are nearly level to depressional.

This association makes up about 17 percent of the county. It is about 55 percent Drummer soils, 40 percent Flanagan soils, and 5 percent soils of minor extent (fig. 1).

The poorly drained Drummer soils are on broad flats. Typically, the surface layer is black silty clay loam about 13 inches thick. The subsurface layer is very dark gray, friable silty clay loam about 5 inches thick. The subsoil is about 37 inches thick. It is mottled. The upper part is dark gray and gray, firm silty clay loam. The lower part is gray, firm and friable silt loam. The underlying material to a depth of 60 inches or more is yellowish brown, mottled fine sandy loam.

The somewhat poorly drained Flanagan soils are on ridges above the Drummer soils. Typically, the surface layer is very dark gray, friable silt loam about 8 inches thick. The subsurface layer is very dark gray, friable silt loam about 7 inches thick. The subsoil is about 40 inches thick. The upper part is dark yellowish brown, friable silt loam. The next part is yellowish brown, mottled, firm silty clay loam. The lower part is dark yellowish brown and grayish brown, mottled, firm clay loam and loam. The underlying material to a depth of 60 inches or more is grayish brown, mottled loam.

Minor in this association are Dana and Peotone soils. The moderately well drained Dana soils are in areas above the major soils. They are subject to water erosion. Peotone soils are very poorly drained and are in depressions below the major soils.

Most of this association is used for cultivated crops, but some areas are used for hay and pasture. The soils are well suited to all of the cultivated crops commonly grown in the county. Corn, soybeans, small grain, and hay grow well. The content of organic matter is high in both of the major soils. Fertility and available water capacity also are high. The main management needs are measures that maintain the drainage system and that maintain tilth and fertility.

2. Drummer-Raub-Dana Association

Nearly level and gently sloping, poorly drained to moderately well drained, silty soils formed in loess and glacial outwash or in loess and glacial till; on till plains

This association is characterized by nearly level and gently sloping ridges and nearly level, broad flats. The soils on the ridges have slopes that are 100 to 800 feet long. The low areas are nearly level to depressional.

This association makes up 29 percent of the county. It is about 52 percent Drummer soils, 26 percent Raub soils, 21 percent Dana soils, and 1 percent soils of minor extent (fig. 2).

The nearly level, poorly drained Drummer soils are on broad flats below the Raub and Dana soils. Typically, the surface layer is black, friable silty clay loam about 13 inches thick. The subsurface layer is very dark gray, friable silty clay loam about 5 inches thick. The subsoil is about 37 inches thick. It is

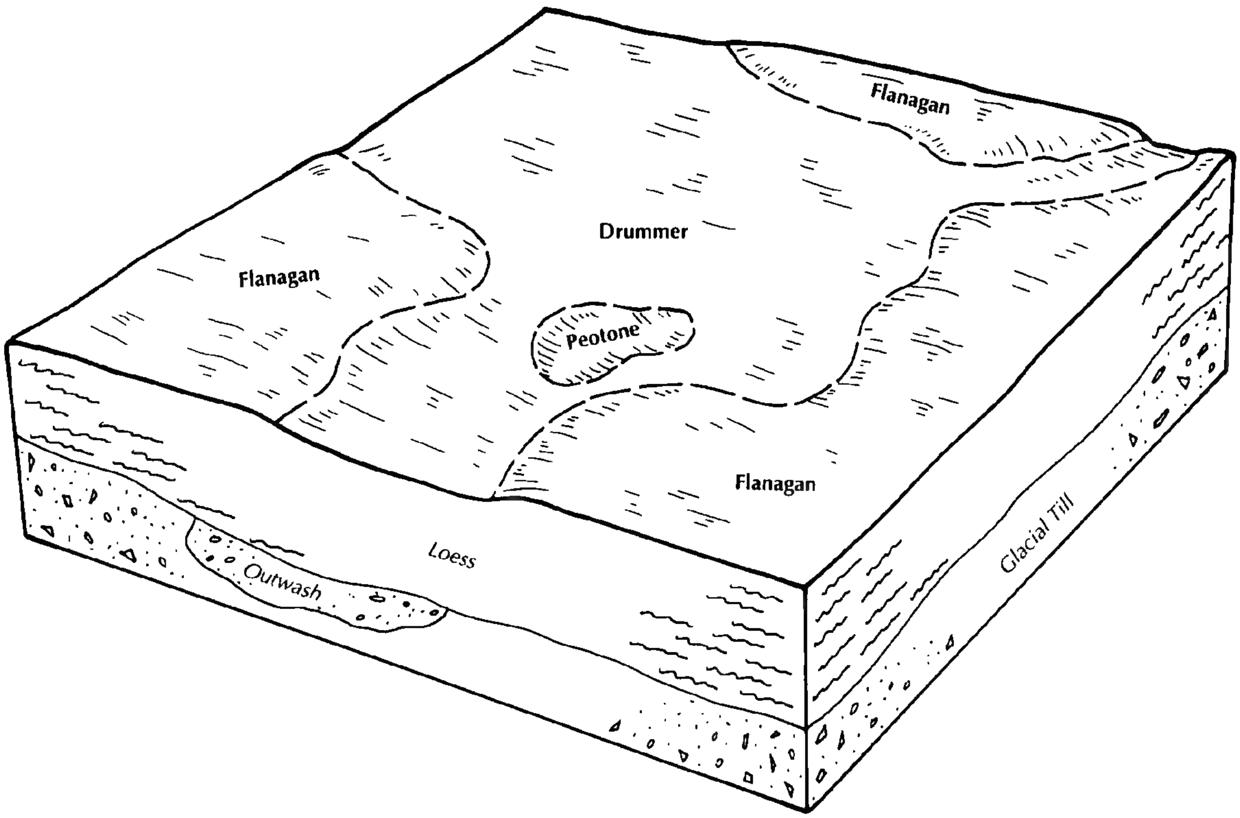


Figure 1.—Typical pattern of soils and parent material in the Drummer-Flanagan association.

mottled. The upper part is dark gray and gray, firm silty clay loam. The lower part is gray, firm and friable silt loam. The underlying material to a depth of 60 inches or more is yellowish brown, mottled fine sandy loam.

The nearly level, somewhat poorly drained Raub soils are on broad ridges above the Drummer soils and below the Dana soils. Typically, the surface layer is very dark gray, friable silt loam about 12 inches thick. The subsoil is about 35 inches thick. It is firm. The upper part is dark yellowish brown silty clay loam. The next part is yellowish brown, mottled silty clay loam. The lower part is yellowish brown, mottled silt loam and loam. the underlying material to a depth of 60 inches or more is yellowish brown, mottled, calcareous loam.

The gently sloping, moderately well drained Dana soils are on ridges above the Raub and Dana soils. Typically, the surface layer is black, friable silt loam about 8 inches thick. The subsurface layer is black, friable silt loam about 5 inches thick. The subsoil is about 43 inches thick. The upper part is dark brown, friable and firm silty clay loam. The next part is dark yellowish brown, mottled, firm silty clay loam. The lower part is dark yellowish brown, mottled, firm clay loam. The underlying material to a depth of 60 inches or more is dark brown, mottled loam.

Minor in this association are Flanagan and Peotone soils. Flanagan soils are somewhat poorly drained and are in landscape positions similar to those of the Raub soils. Peotone soils are very poorly drained and are in depressions below the major soils.

Most of this association is used for cultivated crops, but some areas are used for hay and pasture. The major soils are well suited to cultivated crops. Organic matter content is high in the Drummer soils and moderate in the Raub and Dana soils. Fertility is high in all three soils. Available water capacity also is high. The main management needs are measures that maintain the drainage system in areas of the Drummer and Raub soils, measures that control erosion in areas of the Dana soils, and measures that maintain tilth and fertility in areas of all three soils.

3. Xenia-Fincastle-Toronto Association

Nearly level and gently sloping, moderately well drained and somewhat poorly drained, silty soils formed in loess and glacial till; on till plains

This association is characterized by nearly level ridges, gently sloping side slopes, and nearly flat areas.

It is adjacent to more sloping areas along drainageways.

This association makes up about 25 percent of the county. It is about 38 percent Xenia soils, 22 percent Fincastle soils, 19 percent Toronto soils, and 21 percent soils of minor extent (fig. 3).

The gently sloping, moderately well drained Xenia soils are on the sides of ridges below the Fincastle and Toronto soils. Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The subsurface layer is grayish brown, friable silt loam about 3 inches thick. The subsoil is about 38 inches thick. It is yellowish brown and firm. The upper part is silt loam, the next part is mottled silty clay loam, and the lower part is mottled clay loam. The underlying material to a depth of 60 inches or more is dark yellowish brown, calcareous loam.

The nearly level, somewhat poorly drained Fincastle soils are on ridges above the Xenia soils. Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsurface layer is grayish brown, mottled, firm silt loam about 3 inches thick. The subsoil is about 39 inches thick. It is yellowish brown, mottled, and firm. The upper part is silty clay loam, and the lower part is clay loam and loam. The underlying material to a depth of 60 inches or more is yellowish brown, mottled, calcareous loam.

The nearly level, somewhat poorly drained Toronto soils are in drainageways and on flats above the Xenia and Fincastle soils. Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 36 inches thick. It is mottled and firm. The upper part is yellowish brown silty clay loam, the next part is light brownish gray silty clay loam, and the lower part is light brownish gray loam. The underlying material to a depth of 60 inches or more is light brownish gray, mottled, calcareous loam.

Minor in this association are Drummer and Wingate soils. The poorly drained Drummer soils are in drainageways below the major soils. The moderately well drained Wingate soils have a dark surface layer.

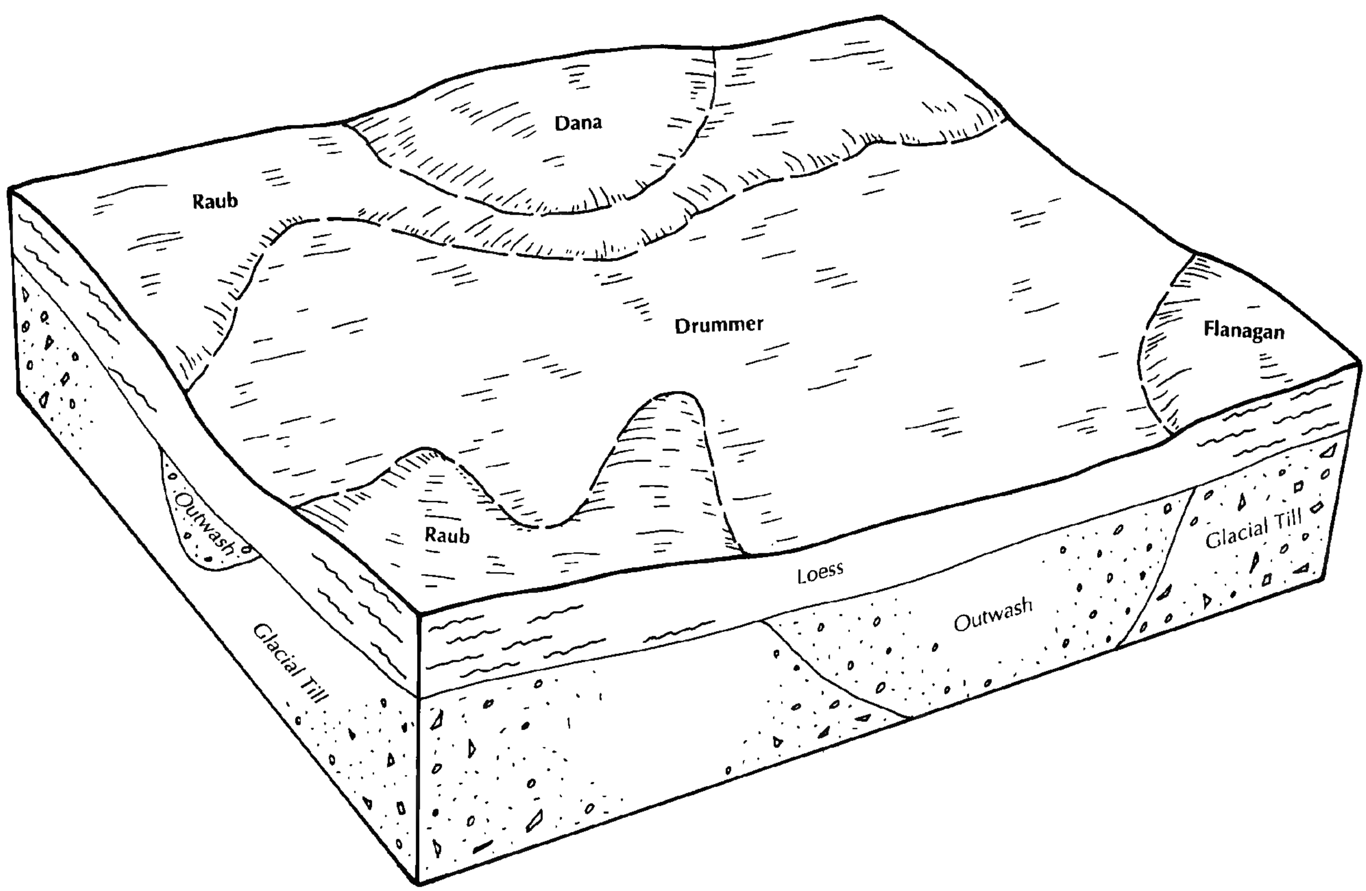


Figure 2.—Typical pattern of soils and parent material in the Drummer-Raub-Dana association.

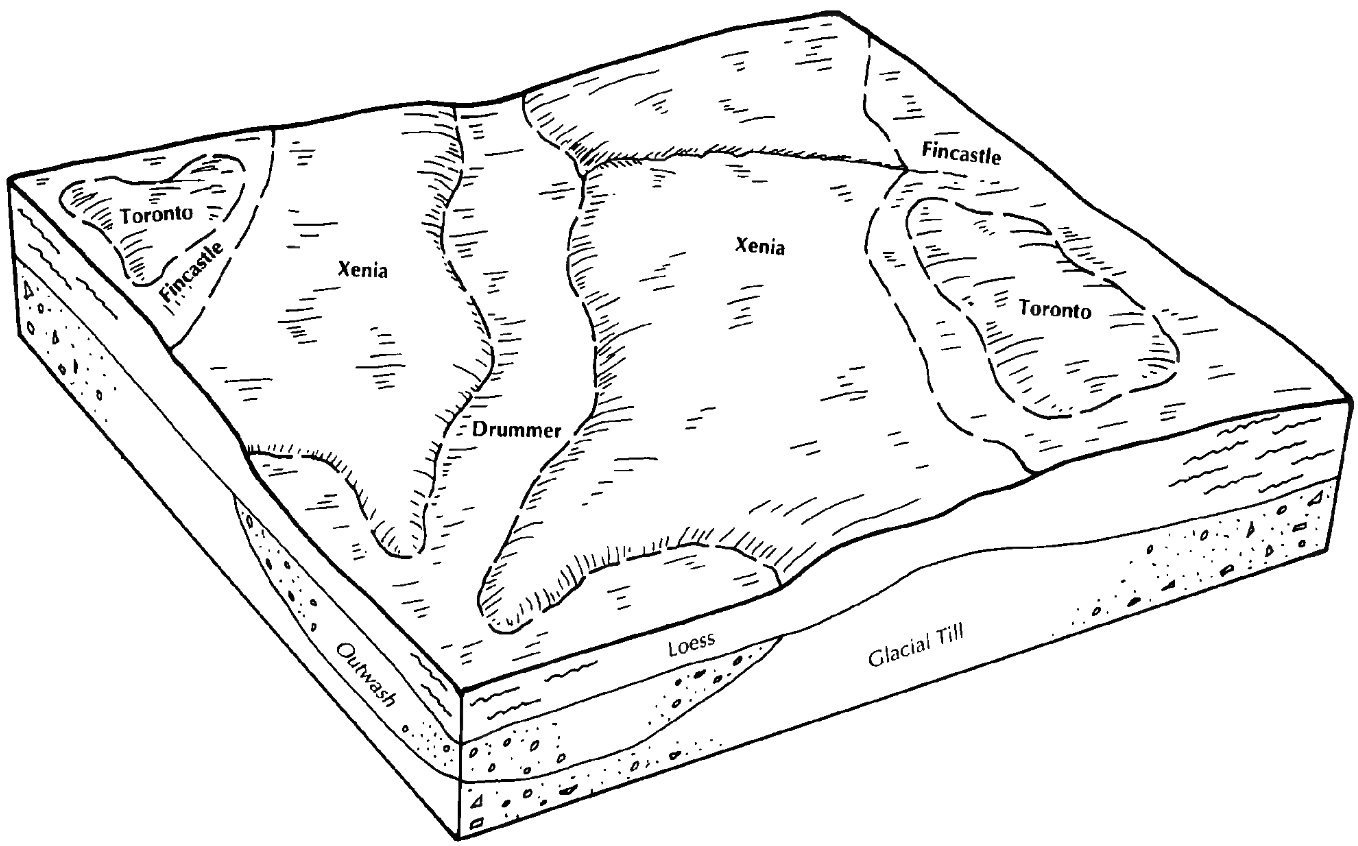


Figure 3.—Typical pattern of soils and parent material in the Xenia-Fincastle-Toronto association.

They are in landscape positions similar to those of the Xenia soils.

Most of this association is used for cultivated crops. Some areas are used for hay, pasture, or woodland. The major soils are well suited to cultivated crops, hay, pasture, and woodland. Organic matter content is moderate in the Toronto soils and moderately low in the Fincastle and Xenia soils. Available water content is high in all three soils. The main management needs are measures that control erosion in areas of the Xenia soils, measures that maintain the drainage system in areas of the Fincastle and Toronto soils, and measures that maintain tilth and fertility in areas of all three soils.

4. Miami-Russell Association

Gently sloping to very steep, well drained, loamy and silty soils formed in glacial till or in loess and glacial till; on till plains

This association consists of soils on narrow ridges between drainageways and on side slopes along drainageways and glacial moraines. Streams and narrow flood plains are in some areas.

This association makes up about 16 percent of the county. It is about 64 percent Miami soils, 12 percent Russell soils, and 24 percent soils of minor extent (fig. 4).

The moderately sloping to very steep, loamy Miami soils are on side slopes below the Russell soils. Typically, the surface layer is brown, friable loam about 5 inches thick. It has been thinned by erosion. The subsurface layer is yellowish brown, friable loam about 4 inches thick. The subsoil is yellowish brown, firm clay loam about 19 inches thick. The underlying material to a depth of 60 inches or more is yellowish brown, calcareous loam.

The gently sloping and moderately sloping, silty Russell soils are on ridgetops and shoulder slopes above the Miami soils. Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is dark yellowish brown, friable silty loam. The next part is dark yellowish brown, firm silty clay loam. The lower part is brown, firm loam and sandy clay loam.

Minor in this association are Camden, Lawson,

Starks, and Xenia soils. The moderately well drained Camden and somewhat poorly drained Starks soils are on outwash plains and stream terraces below the major soils. The somewhat poorly drained Lawson soils are on flood plains below the major soils. The moderately well drained Xenia soils are on the slightly broader ridges above the Russell soils.

Most of this association is used as woodland, but some areas are used for hay and pasture. The major soils generally are high in productivity of forage and woodland. The main management concerns are erosion control and the slope, which limits the use of equipment.

5. Drummer-Starks-Brooklyn Association

Nearly level and gently sloping, poorly drained and somewhat poorly drained, silty soils formed in loess and glacial outwash; on outwash plains and terraces

This association is on outwash plains below the Shelbyville and Westfield moraines. It is characterized by low ridges and broad flats. Short, steep slopes and small areas of flood plains are common. Sand and gravel are mined in some areas.

This association makes up about 8 percent of the county. It is about 50 percent Drummer soils, 14 percent Starks soils, 11 percent Brooklyn soils, and 25 percent soils of minor extent (fig. 5).

The nearly level, poorly drained Drummer soils are in drainageways below the Brooklyn and Starks soils. Typically, the surface layer is black silty clay loam about 13 inches thick. The subsurface layer is very dark gray, friable silty clay loam about 5 inches thick. The subsoil is about 37 inches thick. It is mottled. The upper part is dark gray silty clay loam, and the lower part is gray, friable silt loam. The underlying material to a depth of 60 inches or more is yellowish brown, mottled fine sandy loam.

The nearly level and gently sloping, somewhat poorly drained Starks soils are on ridges and side slopes below the Brooklyn soils and above the Drummer soils.

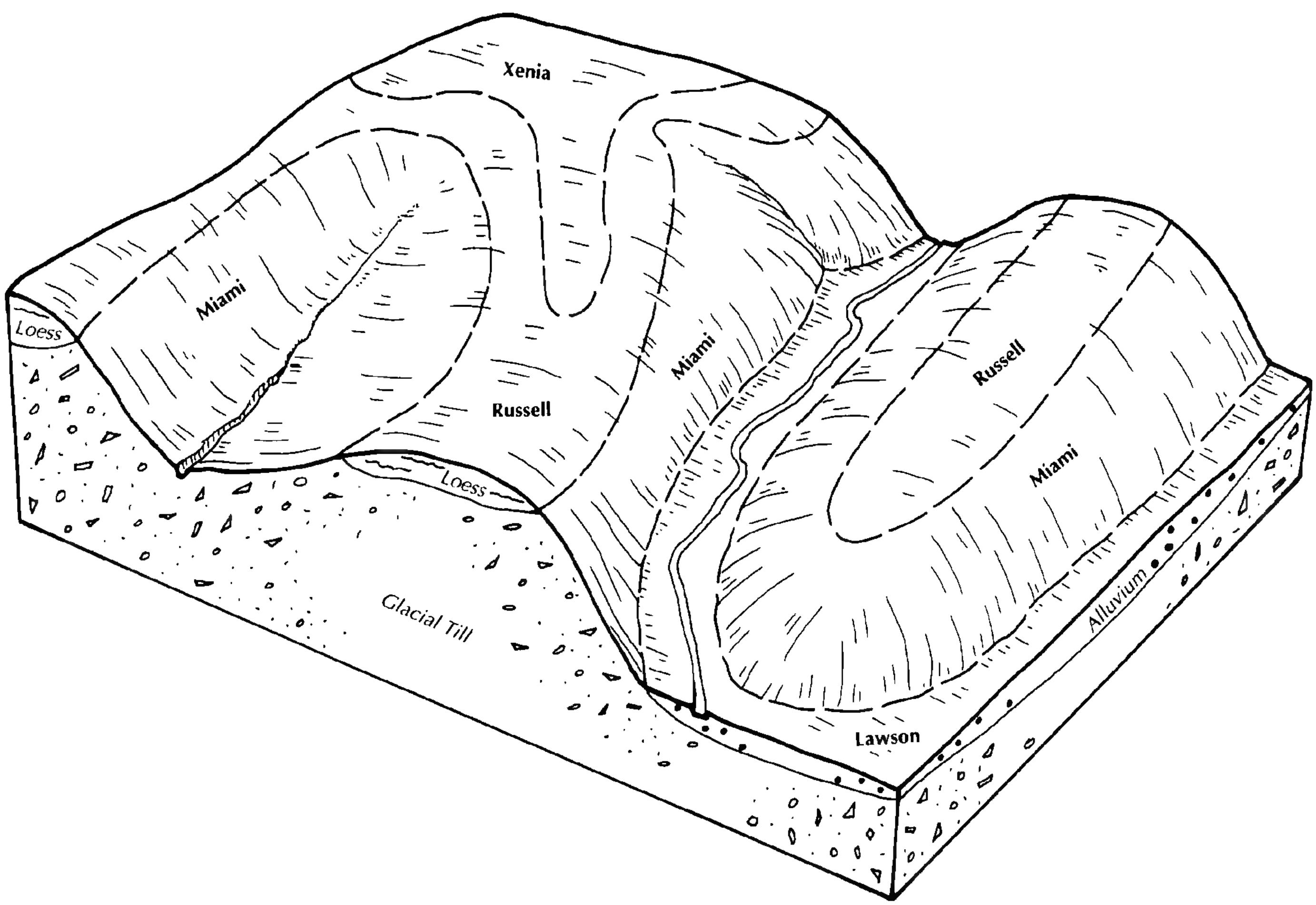


Figure 4.—Typical pattern of soils and parent material in the Miami-Russell association.

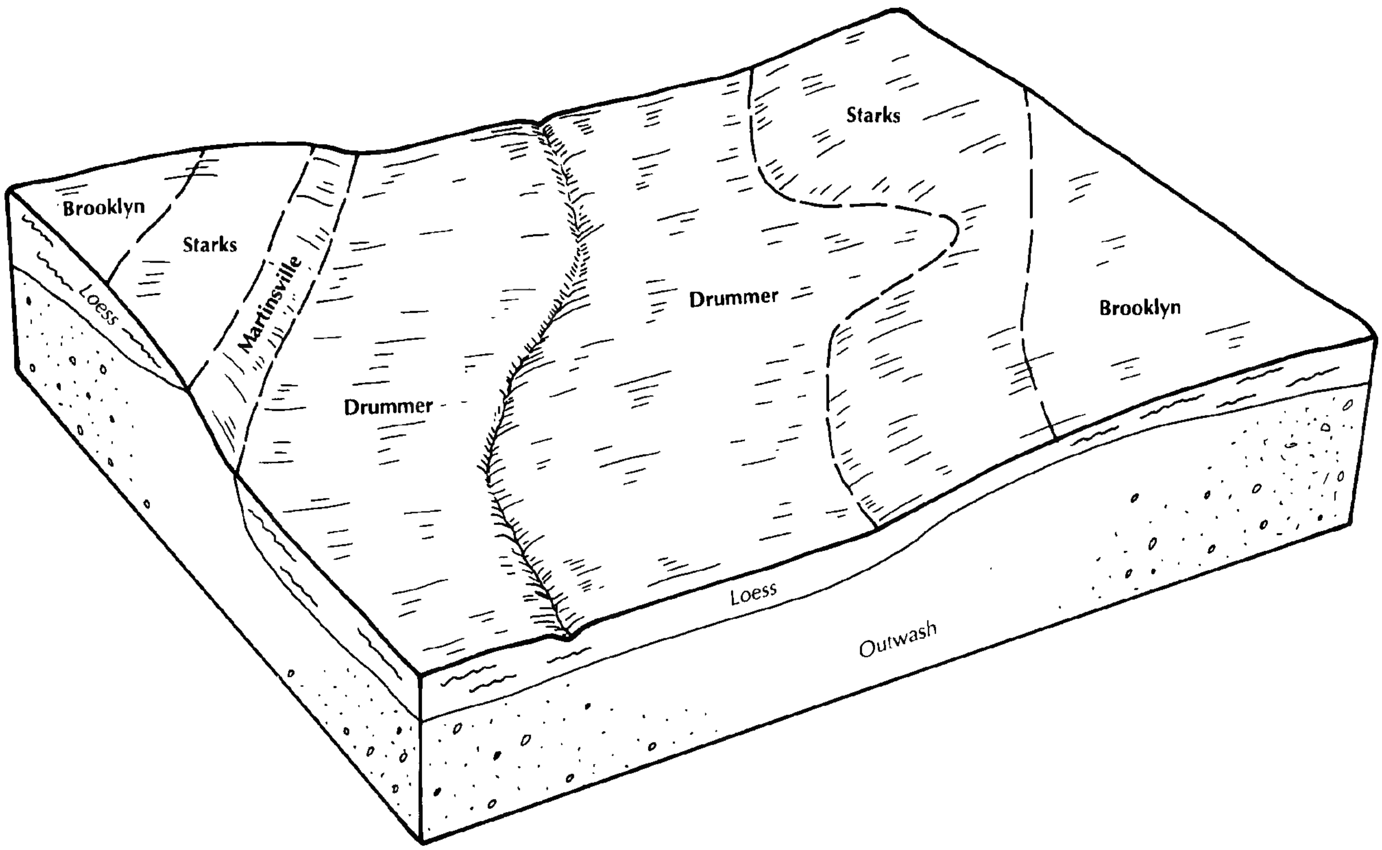


Figure 5.—Typical pattern of soils and parent material in the Drummer-Starks-Brooklyn association.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is brown, mottled, friable silt loam about 5 inches thick. The subsoil is about 31 inches thick. It is mottled and firm. The upper part is yellowish brown silty clay loam, the next part is grayish brown silty clay loam, and the lower part is grayish brown sandy loam. The underlying material to a depth of 60 inches or more is dark yellowish brown sandy loam.

The nearly level, poorly drained Brooklyn soils are on ridges above the Drummer and Starks soils. Typically, the surface layer is black silt loam about 9 inches thick. The subsurface layer is grayish brown, mottled, friable silt loam about 8 inches thick. The subsoil is about 39 inches thick. It is mottled and firm. The upper part is grayish brown silty clay and silty clay loam, and the lower part is gray silty clay loam and silt loam. The underlying material to a depth of 60 inches or more is grayish brown, mottled, stratified silt loam, silty clay loam, and sandy clay loam.

Minor in this association are Martinsville and Xenia soils. The well drained Martinsville soils formed in glacial outwash. They are on side slopes below the Starks soils. The moderately well drained Xenia soils are on the side slopes of the moraine above the major soils.

Most of this association is used for cultivated crops, but some areas are used for hay, pasture, or woodland. The major soils are well suited to cultivated crops. They are well suited or moderately well suited to pasture, hay, and woodland. Available water capacity is high in all of the major soils. Fertility also is high. Organic matter content is high in the Drummer soils, moderately low in the Starks soils, and moderate in the Brooklyn soils. The main management needs are measures that control erosion in the gently sloping areas of the Starks soils and measures that maintain the drainage system and that maintain tilth and fertility in areas of all three soils.

6. Lawson-Landes-Sawmill Association

Nearly level, somewhat poorly drained, well drained, and poorly drained, silty and loamy soils formed in alluvium; on flood plains

This association is on flood plains characterized by swells and by low areas. The difference in elevation between the swells and the low areas commonly is 5 feet or less. Sloughs, streams, meander scars, and

oxbows are in some areas of this association.

This association makes up about 5 percent of the county. It is about 39 percent Lawson soils, 26 percent Landes soils, 15 percent Sawmill soils, and 20 percent soils of minor extent.

The somewhat poorly drained Lawson soils are in areas below the Sawmill soils. Typically, the surface layer is very dark grayish brown, friable silt loam about 11 inches thick. The subsurface layer is very dark grayish brown, mottled, firm silt loam about 15 inches thick. The underlying material to a depth of 60 inches or more is very dark grayish brown silt loam. It has thin strata of loam in the lower part.

The well drained Landes soils are on slight rises above the Lawson and Sawmill soils. Typically, the surface layer is very dark grayish brown, friable sandy loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable fine sandy loam about 10 inches thick. The subsoil is dark brown, friable fine sandy loam about 12 inches thick. The underlying material to a depth of 60 inches or more is dark brown and dark yellowish brown, very friable, stratified loamy fine sand and fine sandy loam.

The poorly drained Sawmill soils are on the lowest part of the flood plain. Typically, the surface layer is very dark grayish brown, friable silty clay loam about 8 inches thick. The subsurface layer is very dark grayish brown, mottled, firm silty clay loam about 18 inches thick. The subsoil is dark gray, mottled, firm silty clay loam about 28 inches thick. The underlying material to a depth of 60 inches or more is dark gray, mottled silty clay loam.

Minor in this association are Camden and Ross soils. The moderately well drained Camden and well drained Ross soils are on stream terraces above the major soils.

Most of this association is used for cultivated crops, but many areas are used for pasture, hay, or woodland. The soils are well suited or moderately suited to cultivated crops, pasture and hay, and woodland. Organic matter content is high in the Lawson and Sawmill soils and moderately low in the Landes soils. Available water capacity is very high in the Lawson soils, high in the Sawmill soils, and moderate in the Landes soils. The main management needs are measures that protect crops from floodwater and that maintain tilth and fertility in areas of all three soils and measures that maintain drainage in areas of the Lawson and Sawmill soils.

Broad Land Use Considerations

The soils in Coles County vary widely in their suitability for major land uses. About 76 percent of the acreage is used for crops, mainly corn and soybeans. About 4 percent is used for pasture, and 5 percent is used as woodland. The remaining acreage consists of urban areas or highways or is used as sites for industries *(13)*. Most of the acreage in associations 1, 2, 4, 5, and 6 is cultivated. These associations are well suited to cultivated crops. Wetness is a problem on the major soils that are nearly level or are in the lower areas, such as Brooklyn, Drummer, Fincastle, Lawson, and Raub soils. Also, flooding may damage crops on the Lawson soils. The more sloping soils in these associations, such as Camden, Starks, and Xenia soils, are susceptible to erosion. Terraces or cropping and tillage systems that help to control erosion are needed on these soils.

Most of the hayland and pasture is in associations 3, 4, and 6. The nearly level Lawson, gently sloping Russell, and moderately sloping and strongly sloping Miami soils are well suited to hay and pasture. The slope limits the suitability of the steep and very steep Miami soils for hay and pasture.

Most of the woodland is in associations 3, 4, and 6. The Fincastle, Landes, Miami, Russell, and Xenia soils in these associations are suited to the production of trees. Because of the erosion hazard and the equipment limitation, the steep Miami soils are only moderately suited to woodland and the very steep Miami soils are poorly suited. The major tree species include white oak, red oak, black oak, hickory, walnut, sugar maple, and ash. Sycamore, silver maple, cottonwood, and box elder are abundant in areas of association 6.

Dwellings and septic tank absorption fields are in areas of all the associations. The soils in association 6 generally are unsuited to dwellings and septic tank absorption fields because of flooding. Most of the major soils in associations 1, 2, 3, 4, and 5 are poorly suited, mainly because of wetness, the shrink-swell potential, restricted permeability, and the slope. The sloping and strongly sloping Miami soils are moderately suited to dwellings and poorly suited to septic tank absorption fields. The gently sloping Camden soils are moderately suited to dwellings without basements and poorly suited to dwellings with basements and to septic tank absorption fields. The gently sloping Russell soils are moderately suited to dwellings and septic tank absorption fields.

The soils in the county are well suited to the development of wildlife habitat. The soils in associations 1, 2, 3, and 5 are well suited to habitat for openland wildlife, the soils in association 4 are well suited to habitat for woodland wildlife, and the soils in association 6 are well suited to habitat for both openland and woodland wildlife.

Recreational uses include camp and picnic areas, playgrounds, and paths and trails. The soils in associations 1, 2, and 5 are poorly suited to these uses because of wetness. The soils in association 6 are poorly suited because of flooding. The Xenia soils in association 3 are moderately suited to recreational uses. Fincastle soils are moderately suited to use as picnic areas and paths and trails but are poorly suited to use as camp areas and playgrounds. Drummer soils are poorly suited to recreational uses. The moderately sloping and strongly sloping Miami soils in association 4 are moderately suited to use as camp and picnic areas, poorly suited to use as playground areas, and well suited to use as paths and trails. The steep Miami soils are moderately suited to use as paths and trails but are poorly suited to other recreational uses because of the slope. The very steep Miami soils are poorly suited to recreational uses. The gently sloping and sloping Russell soils are well suited to use as camp and picnic areas and paths and trails. The gently sloping Russell soils are moderately suited to use as playground areas, but the moderately sloping Russell soils are poorly suited.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Miami loam, 5 to 10 percent slopes, eroded, is a phase of the Miami series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Drummer-Urban land complex is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, quarry, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The "Glossary" defines many of the terms used in describing the soils.

Soil Descriptions

27C2—Miami loam, 5 to 10 percent slopes, eroded. This moderately sloping, well drained soil is on interfluves and side slopes along drainageways in the uplands. Individual areas are irregular in shape and range from 3 to 300 acres in size.

Typically, the surface layer is dark grayish brown, friable loam about 9 inches thick. It has been thinned by erosion. The subsoil is about 31 inches thick. It is strong brown, firm clay loam. The underlying material to a depth of 60 inches or more is strong brown, calcareous clay loam. In some places, the soil is more eroded and the surface layer contains more clay. In other places the underlying material is within a depth of 24 inches. In a few areas the surface layer and the upper part of the subsoil contain less sand.

Water and air move through the subsoil at a moderate rate and through the underlying material at a moderately slow rate. Surface runoff is medium in cultivated areas. Available water capacity is high. Organic matter content is moderately low. In cultivated areas the surface layer tends to crust after hard rains. The shrink-swell potential and the potential for frost action are moderate.

In most areas this soil is used for cultivated crops or for pasture and hay. It is moderately suited to cultivated crops. It is well suited to pasture and hay, to woodland, to habitat for openland and woodland wildlife, and to lawns and landscaping. It is moderately suited to dwellings, septic tank absorption fields, and local roads and streets.

In areas where this soil is used for cultivated crops, further erosion is a hazard. A crop rotation that includes 1 or more years of forage crops, a system of conservation tillage that leaves crop residue on the surface, contour farming, terraces, or a combination of these are needed to control erosion and thus maintain the productivity of the soil. Returning crop residue to the soil or regularly adding other organic material helps to maintain fertility and tilth and increases the rate of water infiltration.

Establishing pasture plants or hay on this soil helps to keep erosion within tolerable limits. Overgrazing, however, reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion. Unmowed strips, 30 to 50 feet wide, along the edge of areas of hayland provide excellent nesting cover for openland wildlife.

If this soil is used as woodland, plant competition is a management concern. It hinders the growth of desirable seedlings. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. The moderately slow permeability is a limitation on sites for septic tank absorption fields. It can be overcome by enlarging the absorption area.

The land capability classification is IIIe.

27C3—Miami loam, 5 to 10 percent slopes, severely eroded. This moderately sloping, well drained soil is on side slopes along drainageways in the uplands. In most areas, the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are irregular in shape and range from 3 to 100 acres in size.

Typically, the surface layer is dark brown, friable loam about 3 inches thick. The subsoil is firm clay loam about 29 inches thick. The upper part is strong brown and dark brown, and the lower part is dark yellowish brown. The underlying material to a depth of 60 inches or more is yellowish brown, calcareous clay loam. In some areas the content of sand in the subsoil is less than 15 percent. In other areas depth to the underlying material is greater.

Included with this soil in mapping are small areas of the moderately well drained Xenia soils. These soils are higher on the landscape than the Miami soil. They make up 3 to 10 percent of the unit.

Water and air move through the subsoil of the Miami soil at a moderate rate and through the underlying material at a moderately slow rate. Surface runoff is medium in cultivated areas. Available water capacity is moderate. Organic matter content is low. Reaction is slightly acid in the upper part of the subsoil and neutral in the lower part. It varies in the surface layer as a result of local liming practices. In cultivated areas the surface layer tends to crust after hard rains. The shrink-swell potential and the potential for frost action are moderate.

In most areas this soil is used for cultivated crops or for pasture and hay. It is poorly suited to cultivated crops. It is well suited to pasture and hay, to woodland, to habitat for openland and woodland wildlife, and to lawns and landscaping. It is moderately suited to dwellings, septic tank absorption fields, and local roads and streets.

In areas where this soil is used for cultivated crops, further erosion is a hazard. A crop rotation that includes 1 or more years of forage crops, a system of conservation tillage that leaves crop residue on the surface, contour farming, terraces, or a combination of these are needed to control erosion and thus maintain the productivity of the soil. Returning crop residue to the soil or regularly adding other organic material helps to maintain fertility and tilth and increases the rate of water infiltration.

Establishing pasture plants or hay on this soil helps to keep erosion within tolerable limits. Overgrazing, however, reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion. Unmowed strips, 30 to 50 feet wide, along the edge of areas of hayland provide excellent nesting cover for openland wildlife.

If this soil is used as woodland, plant competition is a management concern. It hinders the growth of desirable seedlings. The undesirable plants in openings where timber has been harvested can be controlled by

chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. The moderately slow permeability is a limitation on sites for septic tank absorption fields. It can be overcome by enlarging the absorption area.

The land capability classification is IVe.

27D2—Miami loam, 10 to 15 percent slopes, eroded. This strongly sloping, well drained soil is on short, uneven side slopes along drainageways in the uplands. Individual areas are long and narrow or irregular in shape and range from 3 to 80 acres in size.

Typically, the surface layer is brown, friable loam about 5 inches thick. The subsurface layer is yellowish brown, friable loam about 4 inches thick. The subsoil is yellowish brown, firm clay loam about 19 inches thick. The underlying material to a depth of 60 inches or more is yellowish brown, calcareous loam. In some areas depth to the underlying material is greater. In other areas the surface layer is darker.

Included with this soil in mapping are small areas of the moderately well drained Xenia soils. These soils are higher on the landscape than the Miami soil. They make up 3 to 10 percent of the unit.

Water and air move through the subsoil of the Miami soil at a moderate rate and through the underlying material at a moderately slow rate. Surface runoff is rapid in cultivated areas. Available water capacity is high. Organic matter content is moderately low. Reaction is medium acid in the upper part of the subsoil and neutral in the lower part. It varies in the surface layer as a result of local liming practices. The shrink-swell potential and the potential for frost action are moderate.

In most areas this soil is used for pasture and hay. It is well suited to woodland and to woodland wildlife habitat. It is moderately well suited to pasture and hay, dwellings, septic tank absorption fields, and local roads and streets. It is poorly suited to cultivated crops.

Establishing pasture plants or hay on this soil helps to keep erosion within tolerable limits. Timely deferment of grazing helps to prevent surface compaction and excessive runoff. If possible, pasture and hayland should be tilled on the contour when a seedbed is prepared.

If this soil is used as woodland, plant competition is a management concern. It hinders the growth of desirable seedlings. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The wooded areas provide good habitat for woodland wildlife. Livestock should be excluded from the woodland in order to help prevent depletion of the shrubs and sprouts that provide food and cover for woodland wildlife, such as deer, squirrels, and a variety of songbirds. Hedges and rows of shrubs provide cover for doves and many songbirds.

If this soil is used as a site for dwellings, the shrink-swell potential and the slope are limitations. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Cutting and filling help to overcome the slope. The slope and the moderate or moderately slow permeability are limitations on sites for septic tank absorption fields. Enlarging the absorption area helps to overcome the restricted permeability. Installing the filter lines on the contour helps to overcome the slope.

The land capability classification is IVe.

27D3—Miami loam, 10 to 15 percent slopes, severely eroded. This strongly sloping, well drained soil is on side slopes along drainageways in the uplands. In most areas, the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are irregular in shape and range from 3 to 100 acres in size.

Typically, the surface layer is brown, friable loam about 3 inches thick. The subsoil is brown and yellowish brown, firm clay loam about 29 inches thick. The underlying material to a depth of 60 inches or more is yellowish brown, calcareous clay loam. In some areas the surface layer is lighter. In other areas depth to the underlying material is greater.

Water and air move through the subsoil at a moderate rate and through the underlying material at a moderately slow rate. Surface runoff is medium in cultivated areas. Available water capacity is moderate. Organic matter content is low. The surface layer tends to crust after hard rains. The shrink-swell potential and the potential for frost action are moderate.

In most areas this soil is used for pasture and hay. It is well suited to woodland and to woodland wildlife habitat. It is moderately suited to pasture and hay, dwellings, septic tank absorption fields, and local roads and streets. It is generally unsuited to cultivated crops because of the erosion hazard.

Establishing pasture plants or hay on this soil helps to keep erosion within tolerable limits. Timely deferment of grazing helps to prevent surface compaction and excessive runoff. If possible, pasture and hayland should be tilled on the contour when a seedbed is prepared.

If this soil is used as woodland, plant competition is a management concern. It hinders the growth of desirable seedlings. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The wooded areas provide good habitat for woodland wildlife. Livestock should be excluded from the woodland in order to help prevent depletion of the shrubs and sprouts that provide food and cover for woodland wildlife, such as deer, squirrels, and a variety of songbirds. Hedges and rows of shrubs provide cover for doves and many songbirds.

If this soil is used as a site for dwellings, the shrink-swell potential and the slope are limitations. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Cutting and filling help to overcome the slope. The slope and the moderate or moderately slow permeability are limitations on sites for septic tank absorption fields. Enlarging the absorption area helps to overcome the restricted permeability. Installing the filter lines on the contour helps to overcome the slope.

The land capability classification is VIe.

27E—Miami loam, 15 to 30 percent slopes. This moderately steep, well drained soil is on uneven side slopes along drainageways in the uplands. Individual areas are long and narrow and range from 4 to 300 acres in size.

Typically, the surface layer is very dark grayish brown, friable loam about 5 inches thick. The subsurface layer is yellowish brown, friable loam about 5 inches thick. The subsoil is about 18 inches thick. It is dark yellowish brown and yellowish brown, firm clay loam. The underlying material to a depth of 60 inches or more is yellowish brown, calcareous loam. In some areas the subsoil is thinner. In other areas the surface layer is thinner.

Included with this soil in mapping are small areas of Wirt soils. These soils are on flood plains below the Miami soil. They make up 1 to 5 percent of the unit.

Water and air move through the subsoil of the Miami soil at a moderate rate and through the underlying material at a moderately slow rate. Surface runoff is rapid. Available water capacity is high. Organic matter content is moderately low. The shrink-swell potential and the potential for frost action are moderate.

In most areas this soil is wooded. It is moderately suited to woodland. It is well suited to woodland wildlife habitat. It is poorly suited to dwellings and septic tank absorption fields. It is generally unsuited to cultivated crops and to hay because of the erosion hazard.

In areas where this soil is used as woodland, the slope limits the use of equipment and measures that control erosion are needed. Erosion can be controlled by building logging roads and skid trails on or nearly on the contour, skidding logs or trees uphill with a cable and winch on the steeper slopes, establishing grass firebreaks, and seeding bare areas to grass or to a grass-legume mixture after logging activities have been completed. The use of machinery is limited to periods when the soil is firm. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as habitat for woodland wildlife, livestock should be excluded from the woodland in order to help prevent depletion of the shrubs and sprouts that provide food and cover for woodland wildlife, such as deer, squirrels, and a variety of songbirds. Hedges and rows of shrubs provide cover for doves and many songbirds.

Nature paths and trails can be established on this soil. Erosion is the main hazard if the plant cover is removed during construction. Stairways and handrails are needed in the steeper areas.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Cutting and filling help to overcome the slope. The slope and the moderate or moderately slow permeability are limitations on sites for septic tank absorption fields. Enlarging the absorption area helps to overcome the restricted permeability. Installing the filter lines on the contour helps to overcome the slope.

The land capability classification is VIe.

27G—Miami loam, 30 to 60 percent slopes. This very steep, well drained soil is on uneven side slopes in the uplands. It is adjacent to flood plains. Individual areas are long and narrow and range from 10 to 300 acres in size.

Typically, the surface layer is very dark grayish

brown, friable loam about 5 inches thick. The subsurface layer is brown, friable loam about 5 inches thick. The subsoil is firm clay loam about 24 inches thick. The upper part is yellowish brown, and the lower part is dark yellowish brown and brown. The underlying material to a depth of 60 inches or more is dark yellowish brown, calcareous loam. In some areas the subsoil is thinner. In other areas slopes are as much as 60 percent.

Included with this soil in mapping are small areas of Wirt soils. These soils are on flood plains below the Miami soil. They make up 3 to 10 percent of the unit.

Water and air move through the subsoil of the Miami soil at a moderate rate and through the underlying material at a moderately slow rate. Surface runoff is rapid. Available water capacity is high. Organic matter content is moderately low. The shrink-swell potential and the potential for frost action are moderate.

In most areas this soil is wooded. It is moderately suited to woodland. It is well suited to woodland wildlife habitat. It is generally suited to dwellings, septic tank absorption fields, and local roads and streets. It is unsuited to cultivated crops and to hay because of the slope and the severe hazard of erosion.

In areas where this soil is used as woodland, the slope limits the use of equipment and measures that control erosion are needed. Erosion can be controlled by building logging roads and skid trails on or nearly on the contour, skidding logs or trees uphill with a cable and winch on the steeper slopes, establishing grass firebreaks, and seeding bare areas to grass or to a grass-legume mixture after logging activities have been completed. The use of machinery is limited to periods when the soil is firm. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as habitat for woodland wildlife, livestock should be excluded from the woodland in order to help prevent depletion of the shrubs and sprouts that provide food and cover for woodland wildlife, such as deer, squirrels, and a variety of songbirds. Hedges and rows of shrubs provide cover for doves and many songbirds.

The land capability classification is VIIe.

56B—Dana silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on ridgetops on till plains and moraines. Individual areas are irregular in shape and range from 4 to 100 acres in size.

Typically, the surface layer is black, friable silt loam about 8 inches thick. The subsurface layer is black, friable silt loam about 5 inches thick. The subsoil is about 43 inches thick. It is firm. The upper part is dark brown silty clay loam; the next part is dark yellowish brown, mottled silty clay loam; and the lower part is dark yellowish brown, mottled clay loam. The underlying material to a depth of 60 inches or more is dark brown, mottled loam. In some areas the surface soil is thinner or lighter in color. In other areas stratified loamy outwash is in the upper part of the underlying material.

Included with this soil in mapping are small areas of the poorly drained Drummer and somewhat poorly drained Raub soils. Drummer soils are in shallow depressions and drainageways below the Dana soil. Raub soils are in the less sloping areas above the Dana soil. Included soils make up 3 to 8 percent of the unit.

Water and air move through the subsoil of the Dana soil at a moderate rate and through the underlying material at a moderately slow rate. Surface runoff is medium in cultivated areas. The seasonal high water table is 3 to 6 feet below the surface during the spring. Available water capacity is high. Organic matter content also is high. The shrink-swell potential is moderate, and the potential for frost action is high.

In most areas this soil is used for cultivated crops. It is well suited to cultivated crops and to pasture and hay. It is moderately suited to dwellings. It is poorly suited to septic tank absorption fields.

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, terraces, or a combination of these.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. The seasonal high water table is an additional limitation on sites for dwellings with basements. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Installing tile lines around the base of the foundations lowers the water table. The seasonal high water table and the moderately slow permeability are limitations on sites for septic tank absorption fields. Unless the distribution lines are installed closer to the surface than is typical, measures that lower the water table are needed. Enlarging the absorption field helps to overcome the restricted permeability.

The land capability classification is IIe.

56B2—Dana silt loam, 2 to 5 percent slopes, eroded. This gently sloping, moderately well drained soil is on convex ridgetops and broad, even side slopes

on till plains and moraines. Individual areas are irregular in shape and range from 3 to 50 acres in size.

Typically, the surface soil is very dark gray, friable silt loam about 8 inches thick. It has been thinned by erosion. The subsoil is about 44 inches thick. It is firm. The upper part is brown silty clay loam; the next part is dark yellowish brown, mottled clay loam; and the lower part is yellowish brown, mottled clay loam and loam. The underlying material to a depth of 60 inches or more is dark brown, mottled, calcareous loam. In some places the surface soil is thicker. In other places stratified loamy outwash overlies the loam till.

Included with this soil in mapping are small areas of the poorly drained Drummer soils. These soils are in drainageways below the Dana soil. They make up 2 to 5 percent of the unit.

Water and air move through the subsoil of the Dana soil at a moderate rate and through the underlying material at a moderately slow rate. Surface runoff is medium in cultivated areas. The seasonal high water table is 3 to 6 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

In most areas this soil is used for cultivated crops. It is well suited to cultivated crops and to pasture and hay. It is moderately suited to dwellings. It is poorly suited to septic tank absorption fields.

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, terraces, or a combination of these (fig. 6).

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. The seasonal high water table is an additional limitation on sites for dwellings with basements. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Installing tile lines around the base of the foundations lowers the water table. The seasonal high water table and the moderately slow permeability are limitations on sites for septic tank absorption fields. Unless the distribution lines are installed closer to the surface than is typical, measures that lower the water table are needed. Enlarging the absorption field helps to overcome the restricted permeability.

The land capability classification is IIe.

73—Ross loam. This nearly level, well drained soil is on flood plains and low stream terraces. It is occasionally flooded for very brief periods from November to June. Individual areas are irregular in shape and range from 3 to 40 acres in size.

Typically, the surface layer is very dark grayish brown, friable loam about 7 inches thick. The subsurface layer is very dark grayish brown, friable loam about 8 inches thick. The subsoil is dark brown and brown, friable loam about 23 inches thick. The underlying material to a depth of 60 inches or more is dark yellowish brown loam. In some areas the surface soil is thinner and lighter in color. In other areas the surface soil and subsoil contain less sand.

Included with this soil in mapping are small areas of Landes soils. These soils are frequently flooded and are in alluvial areas below the Ross soil. They make up 2 to 10 percent of the unit.

Water and air move through the Ross soil at a moderate rate. Surface runoff is slow in cultivated areas. Available water capacity is high. Organic matter content also is high. Reaction ranges from slightly acid to mildly alkaline in the subsoil. It varies in the surface layer as a result of local liming practices. The shrink-swell potential is low, and the potential for frost action is moderate.

In most areas this soil is cultivated. It is well suited to cultivated crops, to woodland, to habitat for openland and woodland wildlife, and to pasture and hay. Because of the flooding, it generally is unsuited to dwellings and septic tank absorption fields and is poorly suited to local roads and streets.

If this soil is used for corn, soybeans, or small grain, flooding is a hazard. Timely field operations and selection of the proper varieties help to overcome this hazard. Keeping tillage at a minimum and returning crop residue to the soil or regularly adding other organic material help to maintain fertility and tilth.

If this soil is used as woodland, plant competition is a management concern. It hinders the growth of desirable seedlings. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The wooded areas provide good habitat for woodland wildlife. Livestock should be excluded from the woodland in order to help prevent depletion of the shrubs and sprouts that provide food and cover for woodland wildlife, such as deer, squirrels, and a variety of songbirds. Hedges and rows of shrubs provide cover for doves and many songbirds. Planting suitable grasses and legumes, such as bromegrass, orchardgrass, ladino clover, alsike clover, and red clover, in open areas and at the border of wooded areas improves the habitat for pheasant and many other kinds of openland wildlife.

If this soil is used as pasture, overgrazing causes

Figure 6.—Crop residue on the surface in an area of Dana silt loam, 2 to 5 percent slopes, eroded.

surface compaction and poor tilth. Proper stocking rates, pasture rotation, restricted use during wet periods, and applications of fertilizer help to keep the pasture in good condition. In areas used for hay, the flooding delays harvesting in some years.

The land capability classification is IIw.

107—Sawmill silty clay loam. This nearly level, poorly drained soil is on flood plains. It is frequently flooded for brief periods from November to June. Individual areas are irregular in shape and range from 10 to 100 acres in size.

Typically, the surface layer is very dark grayish brown, friable silty clay loam about 8 inches thick. The subsurface layer is very dark grayish brown, mottled, firm silty clay loam about 18 inches thick. The subsoil is dark gray, mottled, firm silty clay loam about 28 inches thick. The underlying material to a depth of 60 inches or more is dark gray, mottled silty clay loam. In some areas the subsurface layer is thinner. In other areas overwash of light colored silt loam is at the surface.

Included with this soil in mapping are small areas of the somewhat poorly drained Lawson and Tice soils. These soils are on slight rises above the Sawmill soil. They make up 2 to 10 percent of the unit.

Water and air move through the Sawmill soil at a moderate rate. Surface runoff is slow in cultivated areas. A seasonal high water table is within a depth of 2 feet during the spring. Available water capacity is high. Organic matter content also is high. The shrink-swell potential is moderate, and the potential for frost action is high.

In most areas this soil is cultivated. It is well suited to cultivated crops. It is moderately suited to pasture and hay. Because of the flooding, it generally is unsuited to dwellings and septic tank absorption fields.

The crops commonly grown in the county can be grown on this soil because a drainage system has been installed. Measures that maintain or improve the drainage system are needed. In areas used for corn, soybeans, or small grain, flooding is a hazard. Timely field operations and selection of the proper varieties help to overcome this hazard. Tile drains and surface drains help to prevent excess wetness. Keeping tillage

at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used for pasture, overgrazing causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, restricted use during wet periods, and applications of fertilizer help to keep the pasture in good condition. In areas used for hay, the flooding delays harvesting in some years. Reed canarygrass, redtop, alsike clover, and ladino clover are suited to this soil.

This soil provides good habitat for wetland wildlife. It is generally along the major streams, which provide habitat for game fish. Shallow water areas generally are nearby. The soil also supports grain and seed crops, wild herbaceous plants, wetland plants, and other important wildlife habitat elements.

The land capability classification is IIIw.

132A—Starks silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on broad outwash plains and stream terraces. Individual areas are irregular in shape and range from 3 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is brown, friable silt loam about 5 inches thick. The subsoil is about 31 inches thick. It is mottled and firm. The upper part is yellowish brown and brown silty clay loam, the next part is grayish brown silty clay loam, and the lower part is grayish brown sandy loam. The underlying material to a depth of 60 inches or more is dark yellowish brown, firm sandy loam. In some places the surface soil is darker. In other places the upper part of the subsoil contains less silt and more sand.

Included with this soil in mapping are small areas of the poorly drained Drummer and moderately well drained Camden soils. Drummer soils are in slight depressions below the Starks soil. Camden soils are on slopes below the Starks soil. Included soils make up 2 to 10 percent of the unit.

Water and air move through the Starks soil at a moderate rate. Surface runoff is slow in cultivated areas. A seasonal high water table is 1 to 3 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderately low. Reaction ranges from strongly acid to neutral in the subsoil. It varies in the surface layer as a result of local liming practices. In cultivated areas the surface layer tends to crust after hard rains. The shrink-swell potential is moderate, and the potential for frost action is high.

In most areas this soil is cultivated. It is well suited to cultivated crops, to pasture and hay, to woodland, and to habitat for openland and woodland wildlife. It is moderately suited to lawns and landscaping. It is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

The crops commonly grown in the county can be grown on this soil because a drainage system has been installed. Measures that maintain or improve the drainage system are needed. Tile drains and surface drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

Pasture plants and hay grow well on this soil. Overgrazing or grazing when the soil is too wet, however, reduces forage production and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition.

If this soil is used as woodland, plant competition is a management concern. It hinders the growth of desirable seedlings. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The wooded areas provide good habitat for woodland wildlife. Livestock should be excluded from the woodland in order to help prevent depletion of the shrubs and sprouts that provide food and cover for woodland wildlife, such as deer, squirrels, and a variety of birds. Hedges and rows of shrubs provide cover for doves and other birds.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. It can be lowered by installing foundation drains. The seasonal high water table and the moderate permeability are limitations on sites for septic tank absorption fields. Installing underground drains lowers the water table. Enlarging the absorption area helps to overcome the restricted permeability. A drainage system is needed if lawns and ornamental trees and shrubs are to be established.

The land capability classification is IIw.

132B—Starks silt loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on broad outwash plains and stream terraces. Individual areas are irregular in shape and range from 5 to 35 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 7 inches thick. The subsurface layer is brown, firm silt loam about 4 inches thick. The subsoil is about 49 inches thick. It is mottled and firm. The upper

part is brown silty clay loam, the next part is grayish brown clay and sandy loam, and the lower part is dark yellowish brown loamy sand. In some areas the surface layer is thicker and darker. In other areas the subsoil is thinner.

Included with this soil in mapping are small areas of the poorly drained Drummer and moderately well drained Camden soils. Drummer soils are in slight depressions below the Starks soil. Camden soils are on slopes below the Starks soil. Included soils make up 2 to 10 percent of the unit.

Water and air move through the Starks soil at a moderate rate. Surface runoff is slow in cultivated areas. A seasonal high water table is 1 to 3 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderately low. Reaction ranges from strongly acid to neutral in the subsoil. It varies in the surface layer as a result of local liming practices. In cultivated areas the surface layer tends to crust after hard rains. The shrink-swell potential is moderate, and the potential for frost action is high.

In most areas this soil is cultivated. It is well suited to cultivated crops, to pasture and hay, to woodland, and to habitat for openland and woodland wildlife. It is moderately suited to lawns and landscaping. It is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

The crops commonly grown in the county can be grown on this soil because a drainage system has been installed. Measures that maintain or improve the drainage system are needed. Tile drains and surface drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

Pasture plants and hay grow well on this soil. Overgrazing or grazing when the soil is too wet, however, reduces forage production and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition.

If this soil is used as woodland, plant competition is a management concern. It hinders the growth of desirable seedlings. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The wooded areas provide good habitat for woodland wildlife. Livestock should be excluded from the woodland in order to help prevent depletion of the shrubs and sprouts that provide food and cover for woodland wildlife, such as deer, squirrels, and a variety of birds. Hedges and rows of shrubs provide cover for doves and other birds.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. It can be lowered by installing foundation drains. The seasonal high water table and the moderate permeability are limitations on sites for septic tank absorption fields. Installing underground drains lowers the water table. Enlarging the absorption area helps to overcome the restricted permeability. A drainage system is needed if lawns and ornamental trees and shrubs are to be established.

The land capability classification is IIe.

134B—Camden silt loam, 1 to 5 percent slopes. This gently sloping, moderately well drained soil is in convex areas on outwash plains and stream terraces. Individual areas are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 10 inches thick. The subsoil is about 60 inches thick. The upper part is brown, friable silty clay loam, and the lower part is strong brown, firm clay loam and sandy clay loam. In some areas the surface soil is darker. In other areas the upper part of the subsoil contains less silt and more sand.

Included with this soil in mapping are small areas of the poorly drained Drummer and somewhat poorly drained Starks soils. Drummer soils are in slight depressions below the Camden soil. Starks soils are in the less sloping areas above the Camden soil. Included soils make up 5 to 15 percent of the unit.

Water and air move through the Camden soil at a moderate rate. Surface runoff is medium in cultivated areas. A seasonal high water table is 4 to 6 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderately low. Reaction ranges from strongly acid to neutral in the subsoil. It varies in the surface layer as a result of local liming practices. The shrink-swell potential is moderate, and the potential for frost action is high.

In most areas this soil is cultivated. It is well suited to cultivated crops, to pasture and hay, and to woodland. It is moderately suited to dwellings and septic tank absorption fields.

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, terraces, or a combination of these.

Pasture plants and hay grow well on this soil. Overgrazing, however, reduces forage yields, causes

surface compaction and excessive runoff, and increases the susceptibility to erosion. Rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion. Bromegrass, orchardgrass, timothy, alfalfa, and red clover are suited to this soil.

If this soil is used as woodland, plant competition is a management concern. It hinders the growth of desirable seedlings. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings without basements, the shrink-swell potential is a limitation. The seasonal high water table is a limitation on sites for dwellings with basements. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around the foundations lowers the water table. The seasonal high water table is also a limitation on sites for septic tank absorption fields. It can be lowered by installing underground drains.

The land capability classification is IIe.

136—Brooklyn silt loam. This nearly level, poorly drained soil is on broad outwash plains. Individual areas are irregular in shape and range from 10 to 100 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is grayish brown and light brownish gray, friable silt loam about 8 inches thick. The subsoil is about 39 inches thick. It is mottled and firm. The upper part is grayish brown silty clay and silty clay loam, and the lower part is gray silty clay loam and silt loam. The underlying material to a depth of 60 inches or more is grayish brown, mottled, stratified silt loam, silty clay loam, and sandy clay loam. In some areas the surface layer is thinner and lighter in color. In other areas the subsurface layer is darker.

Included with this soil in mapping are small areas of the somewhat poorly drained Millbrook soils. These soils are on slight rises above the Brooklyn soil. They make up 4 to 10 percent of the unit.

Water and air move through the Brooklyn soil at a slow rate. Surface runoff is slow to ponded in cultivated areas. The seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during the spring. Available water capacity is high. Organic matter content is moderate. The surface layer becomes cloddy if it is plowed when too wet. The shrink-swell potential and the potential for frost action are high.

In most areas this soil is cultivated. It is well suited to cultivated crops. It is moderately suited to pasture and hay. It is poorly suited to dwellings and septic tank absorption fields.

The crops commonly grown in the county can be grown on this soil because a drainage system has been installed. Measures that maintain or improve the drainage system are needed. Tile drains and surface drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used as a site for dwellings, the ponding is a hazard and the shrink-swell potential is a limitation. The ponding can be controlled by lowering the water table with underground drains and by installing surface drains. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. The ponding is a hazard and the slow permeability is a limitation on sites for septic tank absorption fields. A drainage system is needed. Also, adding as much as 2 feet of loamy fill material increases the depth to the seasonal high water table. Enlarging the absorption area helps to overcome the restricted permeability.

The land capability classification is IIw.

148B—Proctor silt loam, 1 to 5 percent slopes. This gently sloping, well drained soil is on ridges, knolls, and short, uneven side slopes on outwash plains and stream terraces. Individual areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 10 inches thick. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is brown and dark brown, friable silt loam; brown, dark yellowish brown, and yellowish brown, firm silty clay loam; yellowish brown, mottled, firm clay loam and sandy clay loam; and dark brown, mottled, firm sandy clay loam. In some areas the surface layer is lighter in color. In other areas the upper part of the subsoil contains more sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Brenton and Millbrook soils and the poorly drained Drummer soils. These soils are in shallow depressions and drainageways below the Proctor soil. They make up 3 to 12 percent of the unit.

Water and air move through the Proctor soil at a moderate rate. Surface runoff is medium in cultivated areas. Available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

In most areas this soil is used for cultivated crops. It is well suited to cultivated crops and to pasture and

hay. It is moderately suited to dwellings and septic tank absorption fields.

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, terraces, or a combination of these.

Pasture plants and hay grow well on this soil. Overgrazing, however, reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion. Bromegrass, orchardgrass, timothy, alfalfa, and red clover are suited to this soil.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. The moderate permeability is a limitation on sites for septic tank absorption fields. Enlarging the absorption area helps to overcome the restricted permeability.

The land capability classification is IIe.

149—Brenton silt loam. This nearly level, somewhat poorly drained soil is on slight rises on broad outwash plains. Individual areas are irregular in shape and range from 3 to 80 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 9 inches thick. The subsurface layer is very dark grayish brown, firm silty clay loam about 5 inches thick. The subsoil to a depth of about 53 inches is yellowish brown and grayish brown, mottled, and firm. The upper part is silty clay loam, and the lower part is clay loam and sandy clay loam. The underlying material to a depth of 60 inches or more is grayish brown, mottled sandy loam. In some areas the subsurface layer is thinner and lighter in color. In other areas the upper part of the subsoil contains more sand.

Included with this soil in mapping are small areas of the poorly drained Drummer and well drained Proctor soils. Drummer soils are in shallow depressions and drainageways below the Brenton soil. Proctor soils are on slight rises above the Brenton soil. Included soils make up 2 to 10 percent of the unit.

Water and air move through the Brenton soil at a moderate rate. Surface runoff is slow in cultivated areas. A seasonal high water table is 1 to 3 feet below the surface during the spring. Available water capacity is high. Organic matter content also is high. The shrink-swell potential is moderate, and the potential for frost action is high.

In most areas this soil is used for cultivated crops. It is well suited to cultivated crops and to pasture and hay. It is poorly suited to dwellings and septic tank absorption fields.

No major limitations affect the use of this soil for corn, soybeans, or small grain. Subsurface tile drains and surface drains function satisfactorily if suitable outlets are available. A conservation tillage system that leaves crop residue on the surface after planting helps to maintain tilth and fertility.

If this soil is used as a site for dwellings or septic tank absorption fields, the seasonal high water table is a limitation. It can be lowered by installing underground drains. The shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling.

The land capability classification is I.

152—Drummer silty clay loam. This nearly level, poorly drained soil is on upland flats and in shallow depressions and drainageways on outwash plains and till plains. It is occasionally ponded for brief periods in the spring. Individual areas are irregular in shape. They average about 100 acres in size but range from 3 to more than 3,000 acres.

Typically, the surface layer is black, friable silty clay loam about 13 inches thick. The subsurface layer is very dark gray, friable silty clay loam about 5 inches thick. The subsoil is about 37 inches thick. It is mottled and firm. The upper part is dark gray and gray silty clay loam, and the lower part is gray silt loam. The underlying material to a depth of 60 inches or more is yellowish brown, mottled fine sandy loam. In a few places the surface layer and subsurface layer are thicker and contain more clay. In some areas the underlying material is dark gray loam or clay loam glacial till. In a few other areas carbonates are within a depth of 35 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Raub and Flanagan soils and the moderately well drained Dana soils. These soils are on knobs and rises above the Drummer soil. Also included are very poorly drained soils in depressions below the Drummer soil. Included soils make up 2 to 10 percent of the unit.

Water and air move through the Drummer soil at a moderate rate. Surface runoff is slow to ponded in cultivated areas. The seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during the spring. Available water capacity is very high. Organic matter content is high. The surface layer becomes cloddy if it is plowed when too wet. The shrink-swell potential is moderate, and the potential for frost action is high.

In most areas this soil is used for cultivated crops. It

is well suited to cultivated crops. It is moderately well suited to pasture and hay. It is poorly suited to septic tank absorption fields.

The crops commonly grown in the county can be grown on this soil because a drainage system has been installed. Measures that maintain or improve the drainage system are needed (fig. 7). In some areas additional drainage measures may be needed. Tile drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used as a site for dwellings, the ponding is a hazard. Lowering the water table with underground drains and installing surface drains help to control the ponding. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. The ponding is also a hazard on sites for septic tank absorption fields. A drainage system is needed. Also, adding as much as 2 feet of loamy fill material increases the depth to the seasonal high water table.

The land capability classification is IIw.

153—Pella silty clay loam. This nearly level, poorly drained soil is on upland flats and in depressions on outwash plains and till plains. It is occasionally ponded for brief periods in winter and early in spring. Individual areas are irregular in shape and range from 3 to 100 acres in size.

Typically, the surface layer is very dark grayish brown, friable silty clay loam about 9 inches thick. The subsurface layer is very dark grayish brown, firm silty clay loam about 5 inches thick. The subsoil is about 26 inches thick. It is firm. The upper part is dark gray silty clay loam; the next part is dark gray, mottled silty clay loam; and the lower part is gray, mottled, calcareous silt loam. The underlying material to a depth of 60 inches or more is gray, mottled, calcareous, stratified silt loam, loam, and silty clay loam. In some areas the depth to carbonates is more than 40 inches. In other areas the underlying material contains more sand. In a few places the surface layer and subsurface layer are thicker and contain more clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Brenton and Raub soils. These soils are on slight rises above the Pella soil. They make up 2 to 5 percent of the unit.

Water and air move through the Pella soil at a moderate rate. Surface runoff is slow to ponded in cultivated areas. The seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during winter and spring. Available water capacity is very high. Organic matter content is high. The surface layer becomes compact and cloddy if it is plowed when too wet. The shrink-swell potential is moderate, and the potential for frost action is high.

In most areas this soil is used for cultivated crops. It is well suited to cultivated crops. It is moderately suited to pasture and hay. It is poorly suited to dwellings and septic tank absorption fields.

The crops commonly grown in the county can be grown on this soil because a drainage system has been installed. Measures that maintain or improve the drainage system are needed. Tile drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used as a site for dwellings, the ponding is a hazard. It can be controlled by lowering the water table with underground drains and by installing surface drains. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. The ponding is also a hazard on sites for septic tank absorption fields. Surface and subsurface drains are needed. Also, adding as much as 2 feet of loamy fill material increases the depth to the seasonal high water table.

The land capability classification is IIw.

154—Flanagan silt loam. This nearly level, somewhat poorly drained soil is on slight rises on till plains and on toe slopes on moraines. Individual areas are irregular in shape and range from 3 to more than 500 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 8 inches thick. The subsurface layer is very dark gray, friable silt loam about 7 inches thick. The subsoil is about 40 inches thick. The upper part is dark yellowish brown, friable silt loam; the next part is yellowish brown and brown, mottled, firm silty clay loam; and the lower part is dark yellowish brown and grayish brown, mottled, firm clay loam and loam. The underlying material to a depth of 60 inches or more is grayish brown, mottled loam. In some areas the subsoil is thinner. In a few places the underlying material is sandy loam, loamy sand, or sand. Some areas are more sloping.

Included with this soil in mapping are small areas of the moderately well drained Dana and poorly drained Drummer soils. Dana soils are on slight rises above the Flanagan soil. Drummer soils are in depressions and drainageways below the Flanagan soil. Included soils make up 2 to 7 percent of the unit.

Water and air move through the upper part of the Flanagan soil at a moderate rate and through the lower part at a moderately slow rate. Surface runoff is slow in cultivated areas. The seasonal high water table is 1.5 to 3.5 feet below the surface during the spring. Available water capacity and organic matter content are high. The

Figure 7.—A drop structure helps to remove surface water and prevent the formation of gullies in an area of Drummer silty clay loam.

shrink-swell potential and the potential for frost action also are high.

In most areas this soil is used for cultivated crops. It is well suited to cultivated crops and to pasture and hay. It is poorly suited to dwellings and septic tank absorption fields.

No major limitations affect the use of this soil for corn, soybeans, or small grain. The seasonal high water table can delay planting in some years. Subsurface tile drains function satisfactorily if suitable outlets are available. A conservation tillage system that leaves crop residue on the surface after planting helps to maintain tilth and fertility.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Installing underground drains lowers the water table. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling.

If this soil is used as a site for septic tank absorption fields, the seasonal high water table and the moderately slow permeability are limitations. Installing underground drains lowers the water table. Enlarging the absorption areas helps to overcome the restricted permeability.

The land capability classification is I.

206—Thorp silt loam. This nearly level, poorly drained soil is in shallow depressions on outwash plains. It is occasionally ponded for brief periods from March to June. Individual areas are round or oblong and range from 3 to 300 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is friable silt loam about 11 inches thick. The upper part is very dark grayish brown, and the lower part is grayish brown and mottled. The subsoil is about 30 inches thick. The upper part is grayish brown, firm silty clay loam; the next part is light brownish gray, firm silty clay loam; and the lower part is light brownish gray, friable clay loam. The underlying material to a depth of 60 inches or more is grayish brown, mottled loam. In some areas the surface layer is thinner. In other areas the surface layer and subsurface layer are silty clay loam. In places the subsoil has a higher content of clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Millbrook and Starks soils. These soils make up 1 to 5 percent of the unit.

Water and air move through the subsoil of the Thorp soil at a slow rate. Surface runoff is slow to ponded in cultivated areas. The seasonal high water table ranges from 0.5 foot above the surface to 2.0 feet below during the spring. Available water capacity is very high. Organic matter content is high. The surface layer becomes cloddy if it is plowed when too wet. The shrink-swell potential is moderate, and the potential for frost action is high.

In most areas this soil is used for cultivated crops. It is well suited to cultivated crops. It is moderately suited to pasture and hay. It is poorly suited to dwellings and septic tank absorption fields.

The crops commonly grown in the county can be grown on this soil because a drainage system has been installed. Measures that maintain or improve the drainage system are needed. Tile drains and surface drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used for pasture and hay, harvesting or grazing during wet periods and overgrazing reduce forage production and cause surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition. Unmowed strips, 30 to 50 feet wide, along the edge of areas of hayland provide excellent nesting cover for openland wildlife.

If this soil is used as a site for dwellings, the ponding is a hazard. Lowering the water table with underground drains and installing surface drains help to control the ponding. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. The ponding is a hazard and the slow permeability is a limitation on sites for septic tank absorption fields. A drainage system is needed. Also, adding as much as 2 feet of loamy fill material increases the depth to the seasonal high water table. Enlarging the absorption area helps to overcome the restricted permeability.

The land capability classification is IIw.

219—Millbrook silt loam. This nearly level, somewhat poorly drained soil is on low ridges on outwash plains. Individual areas are irregular in shape and range from 3 to 100 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is light brownish gray, mottled, friable silt loam about 6 inches thick. The subsoil is about 38 inches thick. It is mottled and firm. The upper part is yellowish brown and grayish brown silty clay loam, and the lower part is light brownish gray and grayish brown clay loam. The underlying material to a depth of 60 inches or more is dark yellowish brown and yellowish brown, stratified clay loam, sandy clay loam, and silt loam. In some areas the surface layer is lighter in color. In other areas the subsoil contains more sand. Some areas are more sloping.

Included with this soil in mapping are small areas of the poorly drained Brooklyn and Thorp soils. These soils are in drainageways and depressions below the Millbrook soil. They make up 2 to 10 percent of the unit.

Water and air move through the Millbrook soil at a moderate rate. Surface runoff is slow in cultivated areas. A seasonal high water table is 1 to 3 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderate. The shrink-swell potential is moderate, and the potential for frost action is high.

In most areas this soil is cultivated. It is well suited to cultivated crops, to woodland, to habitat for openland and woodland wildlife, and to pasture and hay. It is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

The crops commonly grown in the county can be grown on this soil because a drainage system has been installed. Measures that maintain or improve the drainage system are needed. Tile drains and surface drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

Pasture plants and hay grow well on this soil. Harvesting or grazing during wet periods and overgrazing, however, reduce forage production and cause surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition. Unmowed strips, 30 to 50 feet wide, along the edge of areas of hayland provide excellent nesting cover for openland wildlife.

If this soil is used as woodland, plant competition is a

management concern. It hinders the growth of desirable seedlings. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The wooded areas provide good habitat for woodland wildlife. Livestock should be excluded from the woodland in order to help prevent depletion of the shrubs and sprouts that provide food and cover for woodland wildlife, such as deer, squirrels, and a variety of songbirds. Hedges and rows of shrubs provide cover for doves and songbirds.

If this soil is used as a site for dwellings or septic tank absorption fields, the seasonal high water table is a limitation. It can be lowered by installing underground drains. The shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. A drainage system is needed if lawns and ornamental trees and shrubs are to be established.

The land capability classification is I.

226—Wirt silt loam. This nearly level, well drained soil is on flood plains. It is frequently flooded for brief periods from November to June. Individual areas are irregular in shape and range from 5 to 200 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsoil is dark brown and dark yellowish brown, friable and firm silt loam and loam about 23 inches thick. The underlying material to a depth of 60 inches or more is brown and dark yellowish brown, calcareous, stratified loam, sandy loam, and silt loam. In some places the surface layer is lighter in color. In other places it contains more sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Tice soils. These soils are in slight depressions below the Wirt soil. They make up 2 to 6 percent of the unit.

Water and air move through the upper part of the Wirt soil at a moderate rate and through the lower part at a moderately rapid rate. Surface runoff is slow in cultivated areas. Available water capacity is high. Organic matter content is moderately low. The shrink-swell potential is low, and the potential for frost action is moderate.

In most areas this soil is cultivated. It is well suited to cultivated crops, to woodland, and to pasture and hay. Because of the flooding, it generally is unsuited to dwellings and septic tank absorption fields.

In areas used for corn, soybeans, or small grain, flooding is a hazard. Timely field operations and selection of the proper varieties help to overcome this hazard. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

In areas used for pasture, overgrazing causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, restricted use during wet periods, and applications of fertilizer help to keep the pasture in good condition. In areas used for hay, the flooding delays harvesting in some years. Bromegrass, orchardgrass, timothy, alfalfa, and red clover are suited to this soil.

If this soil is used as woodland, plant competition is a management concern. It hinders the growth of desirable seedlings. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The land capability classification is IIw.

284—Tice silty clay loam. This nearly level, somewhat poorly drained soil is on bottom land. It is frequently flooded for brief periods from March to June. Individual areas are irregular in shape and range from 5 to 250 acres in size.

Typically, the surface layer is very dark grayish brown, friable silty clay loam about 7 inches thick. The subsurface layer is very dark grayish brown, firm silty clay loam about 6 inches thick. The subsoil is dark grayish brown and dark brown, mottled, firm silty clay loam about 35 inches thick. The underlying material to a depth of 60 inches or more is grayish brown, mottled silty clay loam. In some areas the surface soil is thinner. In other areas the surface soil and subsoil contain more sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Lawson soils. These soils are in landscape positions similar to those of the Tice soil. They make up 3 to 10 percent of the unit.

Water and air move through the Tice soil at a moderate rate. Surface runoff is slow in cultivated areas. A seasonal high water table is 1 to 3 feet below the surface during the spring. Available water capacity is high. Organic matter content also is high. Reaction is slightly acid or neutral in the subsoil. It varies in the surface layer as a result of local liming practices.

In most areas this soil is cultivated. It is well suited to cultivated crops, to pasture and hay, to woodland, and to woodland wildlife habitat. Because of the flooding, it

generally is unsuited to dwellings and septic tank absorption fields and is poorly suited to local roads and streets.

In areas used for corn, soybeans, or small grain, flooding is a hazard. Timely field operations and selection of the proper varieties help to overcome this hazard. Tile drains help to prevent excess wetness. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used as pasture, overgrazing causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, restricted use during wet periods, and applications of fertilizer help to keep the pasture in good condition. In areas used for hay, the flooding delays harvesting in some years.

If this soil is used as woodland, plant competition is a management concern. It hinders the growth of desirable seedlings. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The wooded areas provide good habitat for woodland wildlife. Livestock should be excluded from the woodland in order to help prevent depletion of the shrubs and sprouts that provide food and cover for woodland wildlife, such as deer, squirrels, and a variety of songbirds. Hedges and rows of shrubs provide cover for doves and many songbirds. Planting suitable grasses and legumes, such as bromegrass, orchardgrass, ladino clover, alsike clover, and red clover, in open areas and at the border of wooded areas improves the habitat for pheasant and many other kinds of openland wildlife.

The land capability classification is IIlw.

291B—Xenia silt loam, 1 to 5 percent slopes. This gently sloping, moderately well drained soil is on ridgetops and toe slopes on till plains. Individual areas are irregular in shape and range from 3 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The subsurface layer is grayish brown, friable silt loam about 2 inches thick. The subsoil is about 49 inches thick. The upper part is yellowish brown, friable silt loam; the next part is yellowish brown, mottled, firm silty clay loam; and the lower part is yellowish brown, mottled, firm clay loam. The underlying material to a depth of 60 inches or more is yellowish brown, calcareous clay loam. In some areas the surface layer is thicker and lighter in color. In other areas the upper part of the subsoil contains more sand.

Included with this soil in mapping are small areas of the poorly drained Drummer and somewhat poorly drained Fincastle and Toronto soils. Fincastle and Toronto soils are in nearly level areas above the Xenia soil. Drummer soils are in shallow depressions and drainageways below the Xenia soil. Included soils make up 2 to 10 percent of the unit.

Water and air move through the Xenia soil at a moderately slow rate. Surface runoff is medium in cultivated areas. A seasonal high water table is 2 to 6 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderately low. Reaction is slightly acid or medium acid in the subsoil. It varies in the surface layer as a result of local liming practices. In cultivated areas the surface layer tends to crust after hard rains. The shrink-swell potential is moderate, and the potential for frost action is high.

In most areas this soil is cultivated. It is well suited to cultivated crops, to pasture and hay, to woodland, to habitat for openland and woodland wildlife, and to lawns and landscaping. It is moderately well suited to dwellings without basements. It is poorly suited to dwellings with basements, to septic tank absorption fields, and to local roads and streets.

In areas used for corn, soybeans, or small grain, erosion is a hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, terraces, or a combination of these. Returning crop residue to the soil or regularly adding other organic material helps to maintain fertility and tilth and increases the rate of water infiltration.

Establishing pasture plants or hay on this soil helps to keep erosion within tolerable limits. Overgrazing, however, reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion.

If this soil is used as woodland, plant competition is a management concern. It hinders the growth of desirable seedlings. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The wooded areas provide good habitat for woodland wildlife. Livestock should be excluded from the woodland in order to help prevent depletion of the shrubs and sprouts that provide food and cover for woodland wildlife, such as deer, squirrels, and a variety

of birds. Hedges and rows of shrubs provide cover for doves and other birds.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. It can be lowered by installing foundation drains. The shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling. The seasonal high water table and the moderately slow permeability are limitations on sites for septic tank absorption fields. Installing underground drains lowers the water table. Enlarging the absorption area helps to overcome the restricted permeability. A drainage system is needed if lawns and ornamental trees and shrubs are to be established.

The land capability classification is IIe.

304—Landes fine sandy loam. This nearly level, well drained soil is on bottom land adjacent to streams. It is frequently flooded for brief periods from January to April. Individual areas are irregular in shape and range from 5 to 150 acres in size.

Typically, the surface layer is very dark grayish brown, friable fine sandy loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable fine sandy loam and sandy loam about 10 inches thick. The subsoil is dark brown, friable fine sandy loam and loamy fine sand about 12 inches thick. The underlying material to a depth of 60 inches or more is dark brown and dark yellowish brown, very friable loamy fine sand and fine sandy loam. In a few areas the surface soil is thinner. In places the subsoil contains less sand.

Included with this soil in mapping are small areas of the well drained Ross and somewhat poorly drained Lawson soils. Ross soils are on slight rises above the Landes soil. Lawson soils are in drainageways and slight depressions below the Landes soil. Included soils make up 2 to 5 percent of the unit.

Water and air move through the subsoil of the Landes soil at a moderately rapid rate and through the underlying material at a rapid rate. Surface runoff is slow in cultivated areas. Available water capacity is moderate. Organic matter content is high. Reaction ranges from slightly acid to mildly alkaline in the subsoil. It varies in the surface layer as a result of local liming practices. The shrink-swell potential is low, and the potential for frost action is moderate.

In most areas this soil is cultivated. It is well suited to cultivated crops, to pasture and hay, to woodland, and to habitat for openland and woodland wildlife. It generally is unsuited to dwellings and septic tank absorption fields. It is poorly suited to local roads and streets.

In areas used for corn, soybeans, or small grain, flooding is a hazard. Timely field operations and selection of the proper varieties help to overcome this hazard. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used as pasture, overgrazing causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, restricted use during wet periods, and applications of fertilizer help to keep the pasture in good condition. In areas used for hay, the flooding delays harvesting in some years.

If this soil is used as woodland, plant competition is a management concern. It hinders the growth of desirable seedlings. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The wooded areas provide good habitat for woodland wildlife. Livestock should be excluded from the woodland in order to help prevent depletion of the shrubs and sprouts that provide food and cover for woodland wildlife, such as deer, squirrels, and a variety of songbirds. Hedges and rows of shrubs provide cover for doves and many songbirds. Planting suitable grasses and legumes, such as bromegrass, orchardgrass, ladino clover, alsike clover, and red clover, in open areas and along the edge of wooded areas improves the habitat for pheasant and many other kinds of openland wildlife.

The land capability classification is IIw.

322B—Russell silt loam, 1 to 5 percent slopes. This gently sloping, well drained soil is on short, uneven side slopes and ridgetops on till plains. Individual areas are irregular in shape and range from 3 to 75 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is dark yellowish brown, friable silt loam; the next part is dark yellowish brown, firm silty clay loam; and the lower part is firm and friable loam and sandy clay loam. In some areas the upper part of the subsoil contains more sand. In a few places the surface soil is darker.

Water and air move through this soil at a moderate rate. Surface runoff is medium in cultivated areas. Available water capacity is high. Organic matter content is moderately low. In cultivated areas the surface layer tends to crust after hard rains. The shrink-swell potential is moderate, and the potential for frost action is high.

In most areas this soil is used for cultivated crops. It

is well suited to cultivated crops, to pasture and hay, and to woodland. It is moderately suited to dwellings and septic tank absorption fields.

In areas used for corn, soybeans, or small grain, erosion is a hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, terraces, or a combination of these. Returning crop residue to the soil or regularly adding other organic material helps to maintain fertility and tilth and increases the rate of water infiltration.

Establishing pasture plants or hay on this soil helps to keep erosion within tolerable limits. Overgrazing, however, reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion. Bromegrass, orchardgrass, timothy, alfalfa, and red clover are suited to this soil.

If this soil is used as woodland, plant competition is a management concern. It hinders the growth of desirable seedlings. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If the soil is used as a site for dwellings, the shrink-swell potential is a limitation. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. The moderate permeability is a limitation on sites for septic tank absorption fields. Enlarging the absorption area helps to overcome the restricted permeability.

The land capability classification is IIe.

322C2—Russell silt loam, 5 to 10 percent slopes, eroded. This moderately sloping, well drained soil is on short, uneven side slopes and ridgetops on till plains. Individual areas are irregular in shape and range from 3 to 75 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 6 inches thick. It has been thinned by erosion. The subsoil extends to a depth of 60 inches or more. It is firm. The upper part is brown and dark yellowish brown silty clay loam, and the lower part is yellowish brown and dark yellowish brown clay loam. In some areas the upper part of the subsoil contains more sand. In a few places the surface soil is darker.

Water and air move through this soil at a moderate rate. Surface runoff is medium in cultivated areas. Available water capacity is high. Organic matter content is moderately low. In cultivated areas the surface layer tends to crust after hard rains. The shrink-swell potential is moderate, and the potential for frost action is high.

In most areas this soil is used for cultivated crops. It is well suited to pasture and hay and to woodland. It is moderately suited to cultivated crops and to dwellings and septic tank absorption fields.

In areas used for corn, soybeans, or small grain, further erosion is a hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, terraces, or a combination of these. Returning crop residue to the soil or regularly adding other organic material helps to maintain fertility and tilth and increases the rate of water infiltration.

Establishing pasture plants or hay on this soil helps to keep erosion within tolerable limits. Overgrazing, however, reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion. Bromegrass, orchardgrass, timothy, alfalfa, and red clover are suited to this soil.

If this soil is used as woodland, plant competition is a management concern. It hinders the growth of desirable seedlings. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. The moderate permeability is a limitation on sites for septic tank absorption fields. Enlarging the absorption area helps to overcome the restricted permeability.

The land capability classification is IIIe.

330—Peotone silty clay loam. This nearly level, very poorly drained soil is in shallow depressions on outwash plains and till plains. It is occasionally ponded for brief periods in winter and early spring (fig. 8). Individual areas are round or oval and range from 3 to 80 acres in size.

Typically, the surface layer is black, firm silty clay loam about 9 inches thick. The subsurface layer is black, firm silty clay loam about 6 inches thick. The subsoil is firm silty clay loam about 25 inches thick. The upper part is very dark gray, and the lower part is dark gray and gray and is mottled. The underlying material to

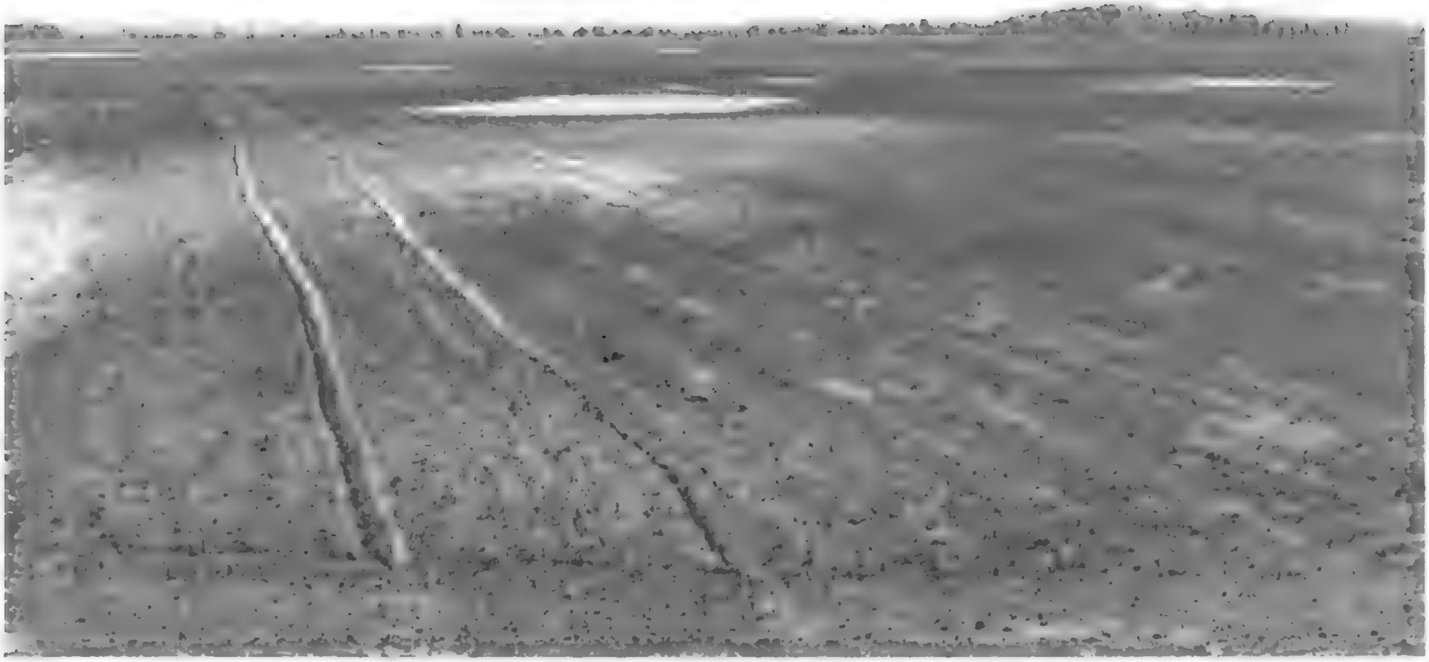


Figure 8.—Ponding in an area of Peotone silty clay loam.

a depth of 60 inches or more is dark gray, mottled silt loam. In some places the upper part of the subsoil is lighter in color. In other places the surface layer, subsurface layer, and subsoil contain less clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Millbrook and Raub soils. These soils are on slight rises and side slopes above the Peotone soil. Also included are soils that are ponded for long periods during the growing season. Included soils make up 2 to 10 percent of the unit.

Water and air move through the Peotone soil at a moderately slow rate. Surface runoff is very slow or ponded in cultivated areas. The seasonal high water table ranges from 0.5 foot above the surface to 1.0 foot below during the spring. Available water capacity is high. Organic matter content also is high. The surface layer becomes compact and cloddy if it is plowed when too wet. The shrink-swell potential and the potential for frost action are high.

In most areas this soil is used for cultivated crops. It is well suited to cultivated crops. It is moderately suited to pasture and hay. Because of the ponding, it is poorly suited to dwellings and local roads and streets and generally is unsuited to septic tank absorption fields.

The crops commonly grown in the county can be grown on this soil because a drainage system has been installed. Measures that maintain or improve the drainage system are needed. Surface drains function satisfactorily if suitable outlets are available. Land grading also helps to control the ponding. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used for pasture and hay, the ponding is a hazard. It can be controlled by surface inlet tile drains or shallow ditches. Restricted use during wet periods helps to keep the pasture in good condition. Reed canarygrass, redtop, alsike clover, and ladino clover are suited to this soil.

The land capability classification is IIw.

348B—Wingate silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on the side slopes of till plains and moraines. Individual areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is very dark grayish

brown, friable silt loam about 8 inches thick. The subsurface layer is dark brown, friable silt loam about 3 inches thick. The subsoil is about 35 inches thick. It is firm. The upper part is dark yellowish brown silty clay loam; the next part is yellowish brown, mottled silty clay loam and clay loam; and the lower part is dark yellowish brown loam. The underlying material to a depth of 60 inches or more is dark yellowish brown loam. In some areas the surface layer is lighter in color. In other areas the subsurface layer is darker.

Included with this soil in mapping are small areas of the poorly drained Drummer and somewhat poorly drained Fincastle and Toronto soils. Drummer soils are in slight depressions and drainageways below the Wingate soil. Fincastle and Toronto soils are in the more level areas above the Wingate soil. Included soils make up 2 to 7 percent of the unit.

Water and air move through the upper part of the Wingate soil at a moderate rate and through the lower part at a moderately slow rate. Surface runoff is medium in cultivated areas. The seasonal high water table is 2.5 to 5.0 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

In most areas this soil is used for cultivated crops. It is well suited to cultivated crops and to pasture and hay. It is moderately suited to dwellings. It is poorly suited to septic tank absorption fields.

In areas used for corn, soybeans, or small grain, erosion is a hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, terraces, or a combination of these. Returning crop residue to the soil or regularly adding other organic material helps to maintain fertility and tilth and increases the rate of water infiltration.

Establishing pasture plants or hay on this soil helps to keep erosion within tolerable limits. Overgrazing, however, reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion. Bromegrass, orchardgrass, timothy, alfalfa, and red clover are suited to this soil.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Installing tile drains around foundations lowers the water table. Reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. The seasonal high water table and the moderately slow permeability are limitations on sites for septic tank absorption fields. Installing underground drains lowers the water table. Enlarging the absorption area helps to overcome the restricted permeability.

The land capability classification is IIe.

353—Toronto silt loam. This nearly level, somewhat poorly drained soil is on broad till plains. Individual areas are irregular in shape and range from 3 to 200 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick (fig. 9). The subsoil is about 36 inches thick. It is mottled and firm. The upper part is yellowish brown silty clay loam, the next part is light brownish gray silty clay loam, and the lower part is light gray loam. The underlying material to a depth of 60 inches or more is light brownish gray, mottled, calcareous loam. In some areas the surface layer is lighter in color. In other areas it is thicker. In places the subsoil contains more sand.

Included with this soil in mapping are small areas of the poorly drained Drummer soils. These soils are in drainageways and depressions below the Toronto soil. They make up 2 to 10 percent of the unit.

Water and air move through the upper part of the Toronto soil at a moderate rate and through the lower part at a moderately slow rate. Surface runoff is slow in cultivated areas. The seasonal high water table is 1 to 3 feet below the surface during winter and spring. Available water capacity is high. Organic matter content is moderate. The shrink-swell potential is moderate, and the potential for frost action is high.

In most areas this soil is cultivated. It is well suited to cultivated crops and to pasture and hay. It is poorly suited to dwellings and septic tank absorption fields.

The crops commonly grown in the county can be grown on this soil because a drainage system has been installed. Measures that maintain or improve the drainage system are needed. Tile drains and surface drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

Pasture plants and hay grow well on this soil. Harvesting or grazing during wet periods and overgrazing, however, reduce forage production and cause surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition. Unmowed strips, 30 to 50 feet wide, along the edge of areas of hayland provide excellent nesting cover for openland wildlife. Bromegrass, orchardgrass, timothy, alfalfa, and red clover are suited to this soil.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. Installing underground drains lowers the water table. Reinforcing

Figure 9.—An area of Toronto silt loam. The surface layer of this soil is lighter in color than that of the included Drummer soils.

foundations helps to prevent the structural damage caused by shrinking and swelling.

If this soil is used as a site for septic tank absorption fields, the seasonal high water table and the moderately slow permeability are limitations. Installing underground drains lowers the water table. Enlarging the absorption area helps to overcome the restricted permeability.

The land capability classification is IIw.

424—Shoals loam. This nearly level, somewhat poorly drained soil is on flood plains. It is frequently flooded for brief periods from November to June. Individual areas are irregular in shape and range from 5 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable loam about 9 inches thick. The upper part of the underlying material is yellowish brown and grayish

brown, mottled silt loam. The lower part to a depth of 60 inches or more is grayish brown, mottled loam and clay loam. In some areas the surface layer is darker. In other areas it contains more sand. In places the underlying material contains less clay.

Included with this soil in mapping are small areas of the well drained Landes soils. These soils are on slight rises above the Shoals soil. They make up 2 to 6 percent of the unit.

Water and air move through the Shoals soil at a moderate rate. Surface runoff is slow in cultivated areas. The seasonal high water table is 0.5 foot to 1.5 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderately low. The shrink-swell potential is low, and the potential for frost action is high.

In most areas this soil is used for cultivated crops. It is well suited to cultivated crops, to woodland, and to pasture and hay. Because of the flooding, it is poorly suited to local roads and streets and is unsuited to dwellings and septic tank absorption fields.

The crops commonly grown in the county can be grown on this soil because a drainage system has been installed. Measures that maintain or improve the drainage system are needed. In areas used for corn, soybeans, or small grain, flooding is a hazard. Timely field operations and selection of the proper varieties help to overcome this hazard. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used as woodland, the equipment limitation, seedling mortality, and the windthrow hazard are management concerns. They are caused by the wetness. Plant competition also is a management concern. It hinders the growth of desirable seedlings. The use of machinery is limited to periods when the soil is firm. The seedling mortality rate can be reduced by planting species that can withstand excessive wetness. Harvesting methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Only high-value trees should be removed from a strip 50 feet wide along the west and south edges of the woodland. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The wooded areas provide good habitat for woodland wildlife. Livestock should be excluded from the woodland in order to help prevent depletion of the shrubs and sprouts that provide food and cover for woodland wildlife, such as deer, squirrels, and a variety of birds. Hedges and rows of shrubs provide cover for doves and other birds.

The land capability classification is IIw.

451—Lawson silt loam. This nearly level, somewhat poorly drained soil is on flood plains. It is frequently flooded for brief periods from November to June. Individual areas are irregular in shape and range from 15 to 160 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 11 inches thick. The subsurface layer is very dark grayish brown, mottled, firm silt loam about 15 inches thick. The underlying material to a depth of 60 inches or more is very dark grayish brown, friable silt loam. It has thin strata of loam in the lower part. In some areas the profile contains more sand. In other areas the underlying material is lighter in color.

Included with this soil in mapping are small areas of the poorly drained Sawmill soils. These soils are in slight depressions below the Lawson soil. They make up 5 to 10 percent of the unit.

Water and air move through the Lawson soil at a moderate rate. Surface runoff is slow in cultivated areas. The seasonal high water table is 1 to 3 feet below the surface during the spring. Available water capacity is very high. Organic matter content is high. The shrink-swell potential is low, and the potential for frost action is high.

In most areas this soil is used for cultivated crops. It is well suited to cultivated crops, to woodland, and to pasture and hay. Because of the flooding, it generally is unsuited to dwellings and septic tank absorption fields.

In areas used for corn, soybeans, or small grain, flooding is a hazard. Timely field operations and selection of the proper varieties help to overcome this hazard. Tile drains help to prevent excess wetness. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used as pasture, overgrazing causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, restricted use during wet periods, and applications of fertilizer help to keep the pasture in good condition. In areas used for hay, the flooding delays harvesting in some years. Bromegrass, orchardgrass, timothy, alfalfa, and red clover are suited to this soil.

If this soil is used as woodland, plant competition is a management concern. Also, the use of machinery is limited to periods when the soil is firm. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent

destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The land capability classification is IIIw.

481—Raub silt loam. This nearly level, somewhat poorly drained soil is on slight rises on till plains and on the toe slopes of moraines. Individual areas are irregular in shape and range from 5 to 300 acres in size.

Typically, the surface soil is very dark gray, friable silt loam about 12 inches thick. The subsoil is about 35 inches thick. It is firm. The upper part is dark yellowish brown silty clay loam; the next part is yellowish brown, mottled silty clay loam; and the lower part is yellowish brown, mottled silt loam and loam. The underlying material to a depth of 60 inches or more is yellowish brown, mottled, calcareous loam. In places the surface layer is thinner and lighter in color. In some areas the upper part of the subsoil contains more sand. In other areas part of the underlying material is brown, stratified loam, sandy loam, and sand. Some areas are more sloping.

Included with this soil in mapping are small areas of the moderately well drained Dana and poorly drained Drummer soils. Dana soils are on ridges and side slopes below the Raub soil. Drummer soils are in depressions and drainageways below the Raub soil. Included soils make up 5 to 15 percent of the unit.

Water and air move through the Raub soil at a moderately slow rate. Surface runoff is slow in cultivated areas. The seasonal high water table is 1 to 3 feet below the surface during winter and spring. Available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

In most areas this soil is used for cultivated crops. It is well suited to cultivated crops and to pasture and hay. It is poorly suited to dwellings and septic tank absorption fields.

The crops commonly grown in the county can be grown on this soil because a drainage system has been installed. Measures that maintain or improve the drainage system are needed. Tile drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. Installing drainage tile around foundations lowers the water table. Reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. The seasonal high water table and the moderately slow permeability are limitations on sites for septic tank absorption fields. Installing underground drains lowers the water table. Enlarging the absorption area helps to overcome the restricted permeability.

The land capability classification is IIw.

496—Fincastle silt loam. This nearly level, somewhat poorly drained soil is in flat and convex areas on till plains. Individual areas are irregular in shape and range from 3 to 200 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsurface layer is grayish brown, mottled, firm silt loam about 3 inches thick. The subsoil is about 39 inches thick. It is yellowish brown, mottled, and firm. The upper part is silty clay loam, and the lower part is clay loam. The underlying material to a depth of 60 inches or more is yellowish brown, mottled, calcareous loam. In some areas the surface layer is darker. In other areas the underlying material is stratified loam and loamy sand.

Included with this soil in mapping are small areas of the poorly drained Drummer soils. These soils are in shallow depressions and drainageways below the Fincastle soil. They make up 2 to 10 percent of the unit.

Water and air move through the upper part of the Fincastle soil at a moderate rate and through the lower part at a moderately slow rate. Surface runoff is slow in cultivated areas. The seasonal high water table is 1 to 3 feet below the surface during winter and spring. Available water capacity is high. Organic matter content is moderately low. In cultivated areas the surface layer tends to crust after hard rains. The shrink-swell potential is moderate, and the potential for frost action is high.

In most areas this soil is used for cultivated crops. It is well suited to cultivated crops, to pasture and hay, and to woodland. It is poorly suited to dwellings and septic tank absorption fields.

The crops commonly grown in the county can be grown on this soil because a drainage system has been installed. Measures that maintain or improve the drainage system are needed. Tile drains and surface drains function satisfactorily if suitable outlets are available. Keeping tillage at a minimum and returning crop residue to the soil help to maintain tilth and fertility.

Pasture plants and hay grow well on this soil. Overgrazing or grazing when the soil is too wet, however, reduces forage production and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition. Bromegrass, orchardgrass, timothy, alfalfa, and red clover are suited to this soil.

If this soil is used as woodland, plant competition is a

management concern. It hinders the growth of desirable seedlings. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. It can be lowered by installing foundation drains. Reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling. The seasonal high water table and the moderately slow permeability are limitations on sites for septic tank absorption fields. Installing underground drains lowers the water table. Enlarging the absorption area helps to overcome the restricted permeability.

The land capability classification is IIw.

533—Urban land. This map unit consists mainly of areas covered by pavement and buildings. Most of the areas are in Charleston and Mattoon. More than 85 percent of the unit is paved areas and buildings. The paved areas are mainly parking lots adjacent to shopping centers, industrial plants, and other commercial buildings. Because of extensive land smoothing, most areas of the unit are nearly level and gently sloping. They commonly are square or rectangular, but some are long and narrow. Typically, they are 40 to 300 acres in size.

Included in this unit in mapping are small areas of Drummer, Fincastle, and Raub soils. These soils support vegetation. They make up 2 to 10 percent of the unit.

Surface runoff generally is very rapid in areas of the Urban land. Because of the design of most of the paved areas, the water typically is diverted to storm drainage systems. In some areas, however, it causes erosion on the adjacent soils and increases the hazard of flooding.

The vegetation is mainly grasses along the border of the urban areas and widely spaced trees and shrubs. Weeds and grasses grow in a few idle areas along the edge of the developed areas. Special management is needed when trees and shrubs are planted and after they are established. Periodic supplemental watering is needed in some areas. Red maple, silver maple, hackberry, green ash, and sycamore can be planted along terraces.

This map unit is not assigned a land capability classification.

570B—Martinsville silt loam, 1 to 5 percent slopes. This gently sloping, well drained soil is on stream terraces and outwash plains. Individual areas are oblong or irregular in shape and range from 5 to 35 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsoil is about 35 inches thick. It is firm. The upper part is dark yellowish brown silty clay loam and loam, the next part is strong brown sandy loam, and the lower part is dark brown coarse sandy loam. The underlying material to a depth of 60 inches or more is yellowish brown, stratified loam and sandy loam. In some areas the surface layer is darker. In other areas the upper part of the subsoil contains less sand and more silt.

Included with this soil in mapping are small areas of the well drained Landes and somewhat poorly drained Starks soils. Landes soils are on flood plains below the Martinsville soil. Starks soils are in shallow depressions and drainageways below the Martinsville soil. Included soils make up 2 to 10 percent of the unit.

Water and air move through the upper part of the Martinsville soil at a moderate rate and through the lower part at a moderately rapid rate. Surface runoff is medium in cultivated areas. Available water capacity is high. Organic matter content is moderately low. The shrink-swell potential and the potential for frost action are moderate.

In most areas this soil is used for cultivated crops. It is well suited to cultivated crops, to woodland, to pasture and hay, and to dwellings and septic tank absorption fields.

In areas used for corn, soybeans, or small grain, erosion is a slight hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, terraces, or a combination of these.

Pasture plants and hay grow well on this soil. Overgrazing, however, reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion. Bromegrass, orchardgrass, timothy, alfalfa, and red clover are suited to this soil.

If this soil is used as woodland, plant competition is a management concern. It hinders the growth of desirable seedlings. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The land capability classification is IIe.

570C2—Martinsville silt loam, 5 to 12 percent slopes, eroded. This moderately sloping, well drained soil is on short, uneven side slopes on stream terraces and outwash plains. Individual areas are irregularly shaped or oblong and range from 5 to 35 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsoil extends to a depth of 60 inches or more. It is firm. The upper part is dark yellowish brown loam, the next part is brown clay loam, and the lower part is yellowish brown and dark yellowish brown sandy loam and sandy clay loam. In a few places the upper part of the subsoil contains less sand and more silt.

Included with this soil in mapping are small areas of the poorly drained Brooklyn and Drummer soils and the somewhat poorly drained Starks soils. These soils are on nearly level ridges above the Martinsville soil. They make up 1 to 10 percent of the unit.

Water and air move through the upper part of the Martinsville soil at a moderate rate and through the lower part at a moderately rapid rate. Surface runoff is medium in cultivated areas. Available water capacity is high. Organic matter content is moderately low. The surface layer tends to crust after hard rains. The shrink-swell potential and the potential for frost action are moderate.

In most areas this soil is used as woodland. It is well suited to woodland and to pasture and hay. It is moderately well suited to cultivated crops and to dwellings and septic tank absorption fields.

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard. A crop rotation that includes 1 or more years of forage crops, a conservation tillage system that leaves crop residue on the surface, contour farming, and terraces help to control erosion. Returning crop residue to the soil and regularly adding organic material help to maintain productivity and tilth.

If this soil is used for pasture, rotation grazing and timely deferment of grazing are needed to prevent surface compaction and excessive runoff and erosion. If possible, the pasture or hayland should be tilled on the contour when a seedbed is prepared. Bromegrass, orchardgrass, timothy, alfalfa, and red clover are suited to this soil.

In areas used as woodland, plant competition is a management concern. It hinders the growth of desirable seedlings. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings, the slope is a limitation. Land shaping by cutting and filling helps to overcome the slope. The slope is also a limitation if the more sloping areas are used as sites for septic tank absorption fields. Installing the filter lines on the contour or land shaping by cutting and filling helps to overcome this limitation.

The land capability classification is IIIe.

864—Pits, quarry. This map unit consists of areas where limestone is quarried, crushed, and screened. It includes the roads and the stockpiles of material in these areas. These excavations are on outwash plains, bottom land, and stream terraces along the Embarras River. Individual areas are square, rectangular, or irregularly shaped and range from 3 to 80 acres in size.

The excavations are generally 20 to 80 feet deep. Some are filled with water and are shown as water areas on the soil maps. The soil material of this map unit has been scraped, mixed, or otherwise altered by mining. It is generally low in fertility and in content of organic matter and supports little or no vegetation. Available water capacity and permeability vary because of the diversity of the soil material and differing degrees of compaction by heavy equipment.

Included in mapping are water areas smaller than 3 acres within the pits and small areas of Lenzburg soils adjacent to the pits. Active gravel pits also are included. Included areas make up 5 to 15 percent of the unit.

Most of the acreage is idle land, but some areas are currently being excavated. Without major reclamation, rock quarries are generally unsuited to farming and building site development. Some areas are suitable for wildlife habitat and recreational uses, such as hiking, camping, and fishing. Some pits containing water could be stocked with fish. In some abandoned areas vegetation should be established. Grasses, trees, and other plants that improve the habitat for wildlife could be established. Some reclamation may be needed before planting. It should include land smoothing and leveling and topdressing with surface soil material. The feasibility of reclamation depends on the conditions at the site and the desired land use.

This map unit is not assigned a land capability classification.

871B—Lenzburg gravelly loam, 1 to 5 percent slopes. This gently sloping, well drained soil is near gravel pits and landfills and in cut and filled areas in the uplands. Individual areas are irregular in shape and range from 5 to 400 acres in size.

Typically, the surface layer is dark yellowish brown, friable gravelly loam about 7 inches thick. The upper part of the underlying material is about 19 inches of mixed grayish brown, yellowish brown, dark yellowish

brown, and greenish gray, calcareous, firm clay loam, gravelly clay loam, and gravelly silty clay loam. The lower part to a depth of 60 inches or more is mixed brown, grayish brown, and dark yellowish brown, calcareous, firm gravelly clay loam.

Included with this soil in mapping are small areas of water and some strongly sloping areas that are not leveled. Also included are some areas of somewhat poorly drained soils. Shallow trenches and depressions also are included. Included areas make up 10 to 15 percent of the unit.

Water and air move through the Lenzburg soil at a moderately slow rate. Surface runoff is slow or medium in vegetated areas. Available water capacity is moderate. Organic matter content is low. Reaction is mildly alkaline. Available phosphorus is low. The content of rock fragments is 13 to 25 percent, by volume. Crusting of the surface layer is common after hard rains, and some differential settling may occur. The content of rock fragments and of dense soil fragments in the underlying material restricts the depth to which roots can penetrate. The shrink-swell potential and the potential for frost action are moderate.

In most areas this soil is used as habitat for openland wildlife or is idle. It is well suited to cultivated crops, to pasture and hay, to habitat for openland and woodland wildlife, and to woodland. It is moderately suited to dwellings and septic tank absorption fields.

If this soil is used for corn, soybeans, or small grain, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface, contour farming, or terraces can help to control erosion. Returning crop residue to the soil and adding other organic material can improve tilth.

Adapted forage plants and hay grow well on this soil. Erosion is a hazard, however, and the short slopes, depressions, and occasional stones on the surface are limitations. Proper stocking rates, pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion. A no-till method of pasture renovation and seeding on the contour help to control erosion during the establishment of forage plants. Allowing sufficient time for the plants to become established before grazing or clipping helps to obtain a good stand of forage. In some areas seeds should be planted and fertilizer applied by hand or by airplane. Overgrazing causes surface compaction and excessive runoff and increases the susceptibility to erosion. Bromegrass, orchardgrass, timothy, alfalfa, and red clover are suited to this soil.

If this soil is used as woodland, plant competition is a management concern. It hinders the growth of desirable seedlings. The undesirable plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

This soil is suited to grain and seed crops and to grasses and legumes, such as bromegrass, orchardgrass, ladino clover, alsike clover, and red clover. These plants improve the habitat for openland wildlife. Measures that protect the habitat from grazing by livestock are essential. The shallow depressions provide nesting areas for certain types of waterfowl.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. The moderately slow permeability is a limitation on sites for septic tank absorption fields. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome the restricted permeability.

The land capability classification is IIe.

871D—Lenzburg loam, 7 to 20 percent slopes. This strongly sloping, well drained soil is near gravel pits and in cut and filled areas in the uplands. Individual areas are irregular in shape and range from 10 to 600 acres in size. Slopes are generally 100 to 200 feet in length.

Typically, the surface layer is mixed very dark grayish brown, gray, and dark yellowish brown, calcareous, firm loam about 8 inches thick. The underlying material to a depth of 60 inches or more is mixed dark yellowish brown, yellowish brown, dark grayish brown, grayish brown, and dark brown, calcareous, firm and very firm clay loam.

Included with this soil in mapping are some gently sloping areas and some steep and very steep areas scattered throughout the unit and in areas adjacent to abandoned gravel pits. Small gravel pits also are included. Also included are shallow trenches and depressions, which often contain water. In a very few areas, deep ponds are also included. Included areas make up 10 to 15 percent of the unit.

Water and air move through the Lenzburg soil at a moderately slow rate. Surface runoff is rapid in vegetated areas. Available water capacity is moderate. Organic matter content is low. Available phosphorus is low. The content of rock fragments is 10 to 15 percent, by volume. Crusting and sealing of the surface layer is common after hard rains. Some areas may be subject to differential settling and slumping. The content of rock fragments and of dense soil fragments in the underlying material restricts the depth to which roots can penetrate. The shrink-swell potential and the potential

for frost action are moderate.

In most areas this soil is used as habitat for openland wildlife or is idle. It is moderately suited to pasture and hay and to woodland. It is generally unsuited to cultivated crops because of the slope. It is well suited to use as habitat for openland and woodland wildlife. It is moderately suited to camp and picnic areas and to dwellings. It is poorly suited to septic tank absorption fields.

Adapted forage plants and hay grow well on this soil. Erosion is a hazard, however, and the short slopes, depressions, and occasional stones on the surface are limitations. Proper stocking rates, pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion. A no-till method of pasture renovation and seeding on the contour help to control erosion during the establishment of forage plants. Allowing sufficient time for the plants to become established before grazing or clipping helps to obtain a good stand of forage. In some areas seeds should be planted and fertilizer applied by hand or by airplane. Overgrazing causes surface compaction and excessive runoff and increases the susceptibility to erosion. Bromegrass, orchardgrass, timothy, alfalfa, and red clover are suited to this soil.

If this soil is used as woodland, measures that protect the woodland from fire and from grazing by livestock are essential. Logging roads and skid trails should be established on the contour. Logs or trees can be skidded uphill with a cable and winch. Surface water can be diverted from logging roads and skid trails with water bars. Firebreaks should be the grass type and should be established on the contour if possible. Bare areas created by logging activities can be seeded to grass or to a grass-legume mixture. Operating machinery only during periods when the soil is firm helps to prevent the formation of ruts. If trees are planted in bare areas, a grass cover should be established between the rows. Also, the trees should be planted on the contour if a mechanical tree planter is used. The seedling mortality rate can be reduced by planting in furrows, by selecting planting stock that is larger than is typical, or by mulching. Some replanting may be needed. Competing vegetation can be controlled by chemical methods.

This soil is suited to grain and seed crops and to grasses and legumes, such as bromegrass, orchardgrass, ladino clover, alsike clover, and red clover. These plants improve the habitat for openland wildlife. Measures that protect the habitat from grazing by livestock are essential. The shallow depressions and scattered shallow ponds provide nesting areas for certain types of waterfowl. The deeper water areas can be used for recreational activities, such as fishing and boating (fig. 10).

If this soil is used as a site for dwellings, the slope and the shrink-swell potential are limitations. Alteration of the slope by cutting, filling, and shaping helps to overcome this limitation. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. The moderately slow permeability and the slope are limitations on sites for septic tank absorption fields. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome the restricted permeability. Cutting and filling or installing the filter lines on the contour helps to overcome the slope.

The land capability classification is VIe.

2152—Drummer-Urban land complex. This nearly level map unit occurs as areas of a poorly drained Drummer soil intermingled with areas of Urban land. It is on smooth flats and in drainageways on till plains. The Drummer soil is occasionally ponded for brief periods. Individual areas of this unit range from 3 to more than 640 acres in size. They are 45 to 60 percent Drummer soil and 25 to 40 percent Urban land.

In a typical area of the Drummer soil, the surface soil is black and very dark gray, firm silty clay loam about 17 inches thick. The subsoil is about 33 inches thick. The upper part is dark gray and gray, mottled, firm silty clay loam, and the lower part is light gray, mottled, friable loam. The underlying material to a depth of 60 inches or more is light gray, mottled, stratified loamy sand and sandy loam. Some of the lower areas have been filled or leveled during construction. Other small areas have been cut, built up, or smoothed.

The Urban land is covered by streets, parking lots, buildings, and other structures. The soils are so obscured that they cannot be identified.

Included in this unit in mapping are small areas of the somewhat poorly drained Raub and moderately well drained Dana soils. These soils are on knobs and rises above the Drummer soil. They make up 10 to 20 percent of the unit.

Water and air move through the Drummer soil at a moderate rate. Available water capacity is high. The organic matter content also is high. The shrink-swell potential is moderate, and the potential for frost action is high. In most areas excess water is drained through storm sewers, gutters, drainage tile, and, to a lesser extent, surface ditches. Unless it is drained, the Drummer soil has a seasonal high water table 0.5 foot above the surface to 2.0 feet below during the spring.

The Drummer soil is used for parks, building site development, lawns, gardens, or golf courses. It is poorly suited to dwellings, septic tank absorption fields,

Figure 10.—A lake in an area of Lenzburg loam, 7 to 20 percent slopes. This area has good potential for recreational development.

and local roads and streets. Erosion is a hazard in areas where the surface is bare and in areas used as watercourses.

If the Drummer soil is used as a site for dwellings or septic tank absorption fields, the ponding is a hazard. Also, the shrink-swell potential is a limitation on sites for dwellings without basements. Measures that remove ponded water and lower the water table are needed. Reinforcing the foundations of dwellings without basements helps to prevent the structural damage caused by shrinking and swelling. A drainage system is needed on sites for septic tank absorption fields. Also, adding as much as 2 feet of loamy fill material increases the depth to the water table. If these measures are not feasible, municipal sanitary treatment facilities should be used.

Low strength, ponding, frost action, and the shrink-swell potential are problems if the Drummer soil is used as a site for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, frost action, and shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by ponding and by frost action.

This map unit is not assigned a land capability classification.

2291B—Xenia-Urban land complex, 1 to 5 percent slopes. This map unit occurs as areas of a gently sloping, moderately well drained Xenia soil intermingled with gently sloping areas of Urban land. It is on ridgetops on till plains. Individual areas range from 5 to 70 acres in size. They are 50 to 80 percent Xenia soil and 10 to 40 percent Urban land.

In a typical area of the Xenia soil, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 40 inches thick. It is firm. The upper part is dark yellowish brown silty clay loam; the next part is dark yellowish brown, mottled clay loam; and the lower part is yellowish brown, mottled loam. The underlying material to a depth of 60 inches or more is yellowish brown, mottled, calcareous loam. Some of the lower areas have been filled or leveled during construction. Other small areas have been cut, built up, or smoothed.

The Urban land is covered by streets, parking lots, buildings, and other structures. The soils are so obscured that they cannot be identified.

Included in this unit in mapping are small areas of the poorly drained Drummer and somewhat poorly drained Fincastle and Toronto soils. Drummer soils are in shallow depressions and drainageways below the Xenia soil. Fincastle and Toronto soils are in nearly level areas above the Xenia soil. Included soils make up 5 to 15 percent of the unit.

Water and air move through the subsoil of the Xenia soil at a moderately slow rate. Runoff is medium. The seasonal high water table ranges from 2.0 to 3.5 feet below the surface during the spring. Available water capacity is high. Organic matter content is moderately low. The potential for frost action is high, and the shrink-swell potential is moderate.

The Xenia soil is used for parks, paths and trails, lawns, and gardens. It is well suited to lawns, gardens, and ornamental trees and shrubs and to nature paths and trails. It is moderately suited to dwellings without basements. It is poorly suited to dwellings with basements, to septic tank absorption fields, and to local roads and streets.

In areas where the Xenia soil is used for grasses, flowers, vegetables, shrubs, wild herbaceous plants, hardwoods, or coniferous plants, measures that control plant competition are needed.

If the Xenia soil is used as a site for dwellings, the seasonal high water table is a limitation. It can be lowered by installing foundation drains. The shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Erosion and sedimentation are hazards during construction, especially if the surface is bare for a considerable period. The seasonal high water table and the moderately slow permeability are limitations on sites for septic tank absorption fields. Installing underground drains lowers the water table. Enlarging the absorption area helps to overcome the restricted permeability. In most areas municipal treatment facilities are available and should be used.

If the Xenia soil is used for local roads and streets, low strength and the potential for frost action are limitations. They can be overcome by providing suitable subgrade material.

Few limitations affect the use of the Xenia soil for paths and trails. If the soil is developed for other recreational uses, such as playgrounds and athletic fields, some land leveling is needed. Onsite investigation is needed to plan the development of specific sites.

This map unit is not assigned a land capability classification.

2481—Raub-Urban land complex. This nearly level map unit occurs as areas of a somewhat poorly drained Raub soil intermingled with areas of Urban land. It is on slight rises on till plains. Individual areas range from 5 to more than 400 acres in size. They are 40 to 60 percent Raub soil and 30 to 45 percent Urban land.

In a typical area of the Raub soil, the surface soil is very dark brown, friable silt loam about 15 inches thick. The subsoil is about 38 inches thick. The upper part is very dark grayish brown, friable and firm silty clay loam; the next part is yellowish brown, mottled, friable and firm silty clay loam; and the lower part is brown, mottled, firm loam. The underlying material to a depth of 60 inches or more is yellowish brown, mottled, calcareous loam. In some areas the surface layer is thinner. In other areas the upper part of the subsoil contains more sand. Some of the lower areas have been filled or leveled during construction. Other small areas have been cut, built up, or smoothed.

The Urban land is covered by streets, parking lots, buildings, and other structures. The soils are so obscured that they cannot be identified. In most areas excess water is drained through sewer systems, gutters, drainage tile, and, to a lesser extent, surface ditches. Unless it is drained, the Raub soil has a seasonal high water table 1 to 3 feet below the surface during the spring.

Included in this unit in mapping are small areas of the moderately well drained Dana and poorly drained Drummer soils. Dana soils are on ridges and side slopes below the Raub soil. Drummer soils are in slight depressions and drainageways below the Raub soil. Included soils make up 10 to 20 percent of the unit.

Water and air move through the Raub soil at a

moderately slow rate. Surface runoff is slow. Available water capacity is high. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

The Raub soil is used for parks, building sites, lawns, and gardens. It is moderately well suited to lawns, vegetable and flower gardens, ornamental trees and shrubs, and recreational uses. It is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

If the Raub soil is used as a site for dwellings, the seasonal high water table is a limitation. Installing drainage tile around foundations lowers the water table. Reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. The seasonal high water table and the moderately slow permeability are limitations on sites for septic tank absorption fields. Installing underground drains lowers the water table. Enlarging the absorption area helps to overcome the restricted permeability. If these measures are not feasible, municipal sanitary treatment facilities should be used.

Low strength, the seasonal high water table, the potential for frost action, and the shrink-swell potential are limitations if the Raub soil is used for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, by shrinking and swelling, and by frost action. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by wetness and by frost action.

This map unit is not assigned a land capability classification.

2496—Fincastle-Urban land complex. This nearly level map unit occurs as areas of a somewhat poorly drained Fincastle soil intermingled with areas of Urban land. It is on convex slopes on till plains. Individual areas range from 5 to 80 acres in size. They are 50 to 80 percent Fincastle soil and 15 to 45 percent Urban land.

In a typical area of the Fincastle soil, the surface soil is dark grayish brown, friable silt loam about 9 inches thick. The subsoil is about 28 inches thick. It is mottled. The upper part is dark yellowish brown, firm clay loam and silty clay loam, and the lower part is yellowish brown, friable loam. The underlying material to a depth of 60 inches or more is yellowish brown, mottled, calcareous loam. In a few areas the surface layer is darker. In places the underlying material is stratified loam and sandy loam. Some of the lower areas have been filled or leveled during construction. Other small areas have been cut, built up, or smoothed.

The Urban land is covered by streets, parking lots, buildings, and other structures. The soils are so obscured or modified that they cannot be identified.

Included with the Fincastle soil in mapping are small areas of the poorly drained Drummer and moderately well drained Xenia soils. Drummer soils are in shallow depressions and drainageways below the Fincastle soil. Xenia soils are on slight rises above the Fincastle soil. Included soils make up 5 to 15 percent of the unit.

Water and air move through the upper part of the Fincastle soil at a moderate rate and through the lower part at a moderately slow rate. Surface runoff is slow. Available water capacity is high. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high. In most areas excess water is drained through sewer systems, gutters, drainage tile, and, to a lesser extent, surface ditches. Unless it is drained, the Fincastle soil has a seasonal high water table 1 to 3 feet below the surface during the spring.

The Fincastle soil is used for parks, building sites, lawns, and gardens. It is moderately well suited to lawns, flower and vegetable gardens, ornamental trees and shrubs, and recreational uses. It is poorly suited to dwellings, septic tank absorption fields, and local roads and streets.

If the Fincastle soil is used for grasses, flowers, vegetables, trees, or shrubs, the seasonal high water table is a limitation. Several methods of artificial drainage can be used on this soil. Onsite investigation is needed to determine the best method for a particular area.

If the Fincastle soil is used as a site for dwellings, the seasonal high water table is a limitation. Also, the shrink-swell potential is a limitation on sites for dwellings without basements. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. A drainage system is needed to lower the water table. The seasonal high water table and the moderately slow permeability are limitations on sites for septic tank absorption fields. Installing underground drains lowers the water table. Enlarging the absorption area helps to overcome the restricted permeability. If these measures are not feasible, municipal sanitary treatment facilities should be used.

Low strength and the potential for frost action are limitations if the Fincastle soil is used for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength and by frost action. Installing a drainage system and then grading the roads so that they shed water reduce the wetness and thus help to prevent the damage caused by frost action.

This map unit is not assigned a land capability classification.

Figure 11.—Urban development in an area of prime farmland.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban or built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

A recent trend in land use in some parts of the county has been the loss of some prime farmland to industrial and urban uses (fig. 11). The loss of prime

farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in Coles County that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Some soils that have a seasonal high water table and all soils that are frequently flooded during the growing season qualify as prime farmland only in areas where these limitations have been overcome by drainage measures or flood control. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures. In Coles County most of the naturally wet soils have been adequately drained.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

Andrew B. Cerven, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

About 254,163 acres in Coles County is cropland, 5,552 acres is permanent pasture, and 13,903 acres is woodland. The rest of the acreage is used for roads or occurs as built-up areas or other areas *(13)*. The soils have good potential for increased production of crops, particularly corn and soybeans. This soil survey can be used as a valuable guide to the latest management techniques that increase food and fiber production.

The main management needs in the county are measures that control water erosion and soil blowing. Maintaining the drainage system in areas of wet soils, maintaining fertility and tilth, and preventing compaction also are important management concerns.

On about 61,900 acres, or 19 percent of the total acreage, the hazard of erosion is severe. In most areas soil losses range from 7 to more than 20 tons per acre. Soils that have slopes of 2 percent or more are susceptible to excessive water erosion. Soils with slopes of 1 percent can be susceptible to severe erosion if surface runoff is concentrated or if the slopes are long.

Loss of the surface layer, or sheet erosion, is damaging for three reasons. First, the organic matter content and the natural fertility level are lowered as the surface layer is lost and part of the subsoil is incorporated into the plow layer. As a result, the productivity of the soil is reduced. Second, severe erosion on sloping soils results in deterioration of tilth in the surface soil and reduces the rate of water infiltration. Third, uncontrolled erosion allows sediments to enter drainage ditches, streams, rivers, ponds, and road ditches. Removing these sediments is expensive. Management that controls erosion also helps to prevent

the pollution caused by sedimentation and improves the quality of water for municipal and recreational uses and for fish and wildlife.

Erosion can be controlled by crop rotations that include hay or meadow crops; by cultural practices, such as conservation tillage; and by mechanical practices, such as terraces and grassed waterways.

Terraces are a series of ridges and channels that collect runoff and direct it to a tile line outlet or a grassed waterway (fig. 12). They are suitable on soils that have smooth, uniform slopes. Parallel tile outlet terraces combined with contour farming reduce the rate of erosion by approximately 50 percent and reduce the rate of sedimentation by nearly 90 percent. Various types and designs of terraces are used to control water erosion on gently sloping and moderately sloping soils, such as Dana, Miami, Russell, Starks, Wingate, and Xenia soils.

Contour farming helps to control erosion in gently sloping and moderately sloping areas. If slopes are longer than 200 feet, however, it is effective only if terraces are used to reduce the length of the slopes.

A system of conservation tillage that leaves crop residue on the surface after planting helps to prevent excessive water erosion. The most common conservation tillage systems are chisel plowing, no-till, and ridge planting. No-till is most effective on moderately well drained and well drained soils, such as Camden, Dana, Martinsville, Miami, Proctor, Russell, Wingate, and Xenia soils. In areas of poorly drained soils, leaving crop residue on the surface may cause the soils to dry and warm more slowly. Chisel plowing and ridge planting are suitable on somewhat poorly drained and poorly drained soils, such as Brenton, Brooklyn, Drummer, Flanagan, Millbrook, Pella, Raub, Thorp, and Toronto soils.

Soil blowing is a hazard on bare soils during part of the winter and early in spring. It can be controlled by leaving crop residue on the surface or by planting a winter cover crop.

A drainage system has been installed in most of the somewhat poorly drained, poorly drained, and very poorly drained soils in the county. Many of these soils are naturally so wet that production of the crops commonly grown in the county is not feasible unless a drainage system is installed. Examples are Brenton, Brooklyn, Drummer, Fincastle, Flanagan, Millbrook, Pella, Peotone, Raub, Sawmill, Starks, Thorp, and Toronto soils.

The design of surface and subsurface drainage systems varies with the kind of soil *(4)*. Moderately permeable and moderately slowly permeable soils can be adequately drained by tile if outlets are available. A combination of shallow surface drains and tile drains is needed in some areas of poorly drained and very poorly drained soils that have moderately slow or slow permeability. If a subsurface drainage system is installed in areas of slowly permeable soils, such as Brooklyn soils, the tile lines should be more closely spaced than in areas of more permeable soils. Providing surface inlets to subsurface drains may be needed in depressional areas, such as those in areas of Peotone soils, if surface drainage is not practical.

Soil fertility is naturally medium or high in most of the soils in the county. Most of the dark soils are neutral, and the light colored soils are slightly acid. On most acid soils, applications of limestone raise the pH level.

Most of the light colored soils have a naturally low supply of nitrogen. Some crops, particularly corn and wheat, respond well to applications of nitrogen fertilizer. Planting legumes, which take nitrogen from the air and fix it in the soil, and adding livestock waste help to replenish the nitrogen supply.

Additions of lime, nitrogen, phosphorus, potassium, or other elements needed for optimum yields should be based on the results of soil tests. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime needed.

Soil tilth is an important factor influencing the germination of seeds, the amount of runoff, and the infiltration of water. It is good in granular and porous soils, but it is a problem in areas of soils that have a silty clay loam surface layer. If soils are tilled when wet, they tend to become very cloddy as they dry. As a result of the cloddiness, preparing a good seedbed is difficult. Chisel tilling in the fall generally results in good tilth in the spring.

Compaction is a problem on soils that have a silt loam or silty clay loam surface layer. It can be caused by tilling with heavy equipment too early in the spring when the soils are still wet. Increased compaction results in lower yields, increased runoff, lower rates of water infiltration, excessive quantities of standing water, uneven stands, moisture stressed crops, slow seedling emergence, and restricted root growth. Improving drainage, subsoiling or deep chiseling, deferring tillage operations until periods when the soils are dry, and increasing the content of organic matter help to prevent compaction.

The field crops suited to the soils and climate of the survey area include many that are not commonly grown. Corn and beans are the main crops, and wheat is the main close-growing crop. Alfalfa and alfalfa-orchardgrass are the common hay crops in most areas, but reed canarygrass, alsike clover, and ladino clover are better suited to poorly drained or very poorly drained soils. The grass-legume pasture in the county commonly is a mixture of such species as orchardgrass,

Figure 12.—Parallel tile outlet terraces in an area of Starks silt loam, 2 to 5 percent slopes.

bromegrass, Kentucky bluegrass, tall fescue, alfalfa, and red clover.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents *(5)*. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management *(11)*. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

Robert Blair, district forester, Illinois Department of Conservation, helped prepare this section.

Virgin forests once covered about 30 percent of Coles County. The trees have been cleared from nearly all of the land suitable for cultivation. The remaining woodland is in areas that generally are too steep for cultivation. The soils in these areas have a fair to good potential for growing high-quality trees if the woodland is properly managed.

About 13,903 acres, or about 4 percent of the total acreage, is woodland. The largest areas of woodland are in associations 3, 4, and 6, which are described under the heading "General Soil Map Units." The main species in the uplands are white oak, red oak, black oak, hickory, walnut, sugar maple, and ash. Sycamore, silver maple, cottonwood, and box elder are abundant on the flood plains.

Many of the stands can be improved by measures that thin out mature trees and remove undesirable species. Measures that exclude grazing livestock, prevent fires, and control diseases and insects also are needed.

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils

assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excessive water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; and *F*, a high content of rock fragments in the soil. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, and F.

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, fire lanes, and log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment or season of use is not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It is the dominant species on the soil and the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

The demand for land and facilities for boating, swimming, picnicking, fishing, hunting, hiking, camping, and other forms of outdoor recreation is increasing throughout the county. Public lands available for recreation include Fox Ridge State Park and Lincoln Log Cabin State Park; the Embarras, Kaskaskia, and Little Wabash Rivers and their tributaries; and Lake Charleston, Lake Mattoon, Lake Paradise, and Lake Oakland. Recreational facilities also are available on a few privately owned tracts.

The potential for further recreational development is favorable. The soils that have the best potential are along the Embarras River and its major tributaries, where hilly terrain, wooded slopes, and numerous streams provide a variety of opportunities for recreation (fig. 13).

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. Slight means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding

Figure 13.—Picnic facilities and playground equipment in an area of Xenia silt loam, 1 to 5 percent slopes.

should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Jeffrey M. Versteeg, district wildlife biologist, Illinois Department of Conservation, helped prepare this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or

by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, ash, black walnut, elm, hawthorn, dogwood, hickory, blackberry, and sumac. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are gray dogwood, hazelnut, and American plum.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, and cedar.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, amaranth, beggartick, cordgrass, rushes, sedges, reeds, and cattail.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl and shore bird feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, ring-necked pheasant, white-eyed vireo, field sparrow, cottontail rabbit, red fox, and prairie vole.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, wood thrush, oven bird, tufted titmouse, red-bellied woodpecker, fox squirrel, gray squirrel, southern flying squirrel, eastern chipmunk, raccoon, and white-tailed deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife

attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

In most areas of the county, the wildlife habitat can be improved by providing additional food, cover, or water or a combination of these. In the following paragraphs, the soil associations described in the section "General Soil Map Units" are grouped into wildlife areas.

Wildlife area 1 consists of the Drummer-Flanagan, Drummer-Raub-Dana, Drummer-Starks-Brooklyn, and Lawson-Landes-Sawmill associations. The major soils in these associations are nearly level or gently sloping and are poorly drained to well drained. The Lawson-Landes-Sawmill association is subject to flooding.

This area is mainly cropland. In much of the area, corn and soybeans are grown year after year. Many of the soils are plowed in the fall. The major wildlife species are ring-necked pheasant, bobwhite quail, raccoon, and cottontail rabbit. A few white-tailed deer, coyotes, and nongame openland species, such as deer mice and horned lark, are also in the area. Also, muskrat, beaver, mink, and ducks inhabit the areas along creeks or open drainage ditches. The habitat in this wildlife area generally is poor because it does not have crop residue on the surface, herbaceous nesting and roosting cover, woody cover, or travel lanes or hedgerows. The habitat can be improved by leaving the grassy cover on roadsides, ditchbanks, and waterways unmowed until after the nesting season (generally August 1); by protecting the woody cover; and by leaving crop residue on the surface. Planting preferred grasses, such as native prairie grasses, in idle areas, on ditchbanks, and along field borders can also greatly improve habitat.

Wildlife area 2 consists of the Xenia-Fincastle-Toronto and Miami-Russell associations. The soils in these associations are nearly level to very steep and are somewhat poorly drained to well drained.

This area is very diversified. It is used as cropland, pasture, or woodland (fig. 14). As a result, the habitat generally favors a variety of wildlife. The main wildlife species are white-tailed deer, raccoon, fox squirrel, gray squirrel, cottontail rabbit, ring-necked pheasant, and mourning dove. A few gray foxes, coyotes, and nongame woodland species, such as white-faced mice, red-tailed hawk, and eastern wood pewee, also inhabit this area. The habitat can be improved by properly managing the pastured areas, excluding livestock from the wooded areas, leaving crop residue on the surface, leaving the grassy cover unmowed until after the nesting season, and planting varieties or species of grass and shrubs that are more beneficial to wildlife.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreation uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and

Figure 14.—Wooded side slopes on the flood plain along the Embarras River. These areas provide habitat for wildlife.

topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the "Glossary."

Building Site Development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so

difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to

hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand

or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. These soils may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability in the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a

depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability in the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to help to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 19.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the "Glossary."

Classification of the soils is determined according to the Unified soil classification system *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 19.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in

the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at ⅓ bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and

high, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

8. Soils that are not subject to soil blowing because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 18, the first letter is for drained areas and the

second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs, on the average, once or less in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Engineering Index Test Data

Table 19 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the series described in the section "Soil Series and Their Morphology." The soil samples were tested by the Illinois Department of Transportation.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are AASHTO classification—

M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); and Moisture density, Method A—T 99 (AASHTO), D 698 (ASTM).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(12)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 20 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquoll (*Aqu*, meaning water, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquolls (*Hapl*, meaning minimal horizonation, plus *aquoll*, the suborder of the Mollisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplaquolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, mesic Typic Haplaquolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" *(10)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(12)*. Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Brenton Series

The Brenton series consists of somewhat poorly drained, moderately permeable soils on outwash plains. These soils formed in loess and in the underlying loamy

outwash. Slopes range from 0 to 2 percent.

Brenton soils are similar to Flanagan, Millbrook, and Raub soils. Flanagan soils have more clay in the argillic horizon than the Brenton soils. Also, they formed in thicker loess and in the underlying glacial till. Millbrook soils have a thinner dark surface soil than the Brenton soils. Raub soils formed in loess and in the underlying glacial till.

Typical pedon of Brenton silt loam, 1,700 feet east and 60 feet north of the southwest corner of sec. 15, T. 11 N., R. 7 E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak fine granular structure; friable; slightly acid; abrupt smooth boundary.

A—9 to 14 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; firm; medium acid; clear smooth boundary.

Bt1—14 to 26 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct grayish brown (10YR 5/2) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; firm; common distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; few fine rounded black accumulations (iron and manganese oxide); medium acid; clear smooth boundary.

Bt2—26 to 31 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); slightly acid; clear smooth boundary.

2Bt3—31 to 37 inches; grayish brown (10YR 5/2) clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); neutral; clear smooth boundary.

2BC—37 to 53 inches; grayish brown (10YR 5/2) sandy clay loam; many fine and medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; few distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; neutral; clear smooth boundary.

2C—53 to 60 inches; grayish brown (10YR 5/2) sandy loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; mildly alkaline.

The thickness of the solum ranges from 38 to 60 inches. The thickness of the overlying loess ranges from 24 to 40 inches. The thickness of the mollic epipedon ranges from 10 to 22 inches. The content of clay ranges from 25 to 35 percent in the control section.

The Ap and A horizons have value of 2 or 3. The Bt horizon has value of 4 or 5 and chroma of 2 to 4. The 2Bt horizon has chroma of 2 to 6. It is clay loam, loam, or sandy clay loam. The 2C horizon is clay loam, sandy loam, or loamy sand. It is stratified in some pedons.

Brooklyn Series

The Brooklyn series consists of poorly drained soils on outwash plains. These soils formed in loess and in the underlying stratified loamy outwash. Permeability is slow in the upper part of the profile and moderately slow in the lower part. Slopes range from 0 to 2 percent.

Brooklyn soils commonly are adjacent to Drummer, Millbrook, and Starks soils. The poorly drained Drummer soils are lower on the landscape than the Brooklyn soils, and the somewhat poorly drained Millbrook and Starks soils are higher on the landscape.

Typical pedon of Brooklyn silt loam, 1,900 feet west and 2,600 feet north of the southeast corner of sec. 24, T. 11 N., R. 10 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; slightly acid; abrupt smooth boundary.

E1—9 to 14 inches; grayish brown (10YR 5/2) silt loam; common fine prominent yellowish brown (10YR 5/8) mottles; weak thin platy structure; friable; very strongly acid; abrupt smooth boundary.

E2—14 to 17 inches; light brownish gray (10YR 6/2) silt loam; common fine prominent yellowish brown (10YR 5/8) and brownish yellow (10YR 6/8) mottles; moderate thin platy structure; friable; strongly acid; clear smooth boundary.

Btg1—17 to 25 inches; grayish brown (2.5Y 5/2) silty clay; many medium prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; few distinct dark gray (10YR 4/2) and common prominent light gray (10YR 7/2) clay films on faces of peds; few medium rounded dark accumulations (iron and manganese oxide); medium acid; clear smooth boundary.

Btg2—25 to 36 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium prominent yellowish brown (10YR 5/8) mottles; moderate coarse subangular blocky structure; firm; few distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few medium rounded dark accumulations (iron and

manganese oxide); slightly acid; clear smooth boundary.

Btg3—36 to 45 inches; gray (10YR 5/1) silty clay loam; many coarse prominent dark yellowish brown (10YR 4/6) mottles; moderate coarse subangular blocky structure; firm; few distinct dark grayish brown (10YR 4/2) clay films on faces of peds; common medium rounded dark accumulations (iron and manganese oxide); neutral; clear smooth boundary.

2BCg—45 to 56 inches; gray (10YR 5/1) silt loam; many medium prominent dark yellowish brown (10YR 4/6) mottles; weak coarse subangular blocky structure; firm; few distinct dark gray (10YR 4/1) clay films on faces of peds; common medium rounded dark accumulations (iron and manganese oxide); slightly acid; clear smooth boundary.

2Cg—56 to 60 inches; grayish brown (10YR 5/2), stratified silt loam, silty clay loam, and sandy clay loam; common medium prominent yellowish brown (10YR 5/8) and many medium prominent dark yellowish brown (10YR 4/6) mottles; massive; firm; common medium rounded dark accumulations (iron and manganese oxide); slightly acid.

The thickness of the solum ranges from 49 to 58 inches. The thickness of the overlying loess ranges from 37 to 58 inches. The content of clay ranges from 35 to 45 percent in the control section.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The Btg and 2BCg horizons have hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. The 2BCg horizon is clay loam, sandy clay loam, or silt loam. The 2Cg horizon is stratified silt loam, silty clay loam, loam, sandy clay loam, or loamy sand.

Camden Series

The Camden series consists of moderately well drained, moderately permeable soils on outwash plains and stream terraces. These soils formed in loess and in the underlying stratified, loamy glacial outwash. Slopes range from 1 to 5 percent.

Camden soils are similar to Martinsville, Russell, and Xenia soils. Martinsville soils formed in loamy outwash. Russell and Xenia soils formed in loess and glacial till.

Typical pedon of Camden silt loam, 1 to 5 percent slopes, 720 feet west and 1,300 feet south of the northeast corner of sec. 2, T. 11 N., R. 9 E.

Ap—0 to 10 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak very fine subangular blocky structure parting to moderate fine granular; friable; medium acid; abrupt smooth boundary.

Bt1—10 to 19 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine and very fine subangular blocky structure; friable; many distinct brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—19 to 31 inches; yellowish brown (10YR 5/6) silty clay loam; moderate fine and very fine angular blocky structure; firm; many distinct brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

2Bt3—31 to 40 inches; strong brown (7.5YR 5/6) clay loam; few fine prominent brown (10YR 5/3) mottles; moderate medium subangular blocky structure; firm; common distinct brown (7.5YR 5/4) clay films on faces of peds; common medium irregular dark accumulations (iron and manganese oxide); medium acid; clear smooth boundary.

2BC—40 to 60 inches; strong brown (7.5YR 5/6) sandy clay loam; few fine prominent pale brown (10YR 6/3) mottles; weak coarse subangular blocky structure; firm; few distinct brown (7.5YR 4/4) clay films on faces of peds; few medium irregular dark accumulations (iron and manganese oxide); slightly acid.

The thickness of the solum ranges from 40 to 65 inches. The thickness of the overlying loess ranges from 24 to 40 inches. The content of clay ranges from 22 to 35 percent in the control section.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The Bt and 2Bt horizons have value of 4 to 6 and chroma of 3 to 6. The 2Bt horizon is clay loam or sandy clay loam.

Dana Series

The Dana series consists of moderately well drained soils on till plains and moraines. These soils formed in loess and in the underlying loamy till. Permeability is moderate in the upper part of the profile and moderately slow in the lower part. Slopes range from 2 to 5 percent.

Dana soils are similar to Proctor and Wingate soils. Proctor soils formed in loess and in the underlying loamy outwash. Wingate soils have a thinner dark surface soil than the Dana soils.

Typical pedon of Dana silt loam, 2 to 5 percent slopes, 840 feet east and 1,280 feet south of the northwest corner of sec. 6, T. 12 N., R. 8 E.

Ap—0 to 8 inches; very dark gray (10YR 2/1) silt loam; moderate fine granular structure; friable; slightly acid; abrupt smooth boundary.

A—8 to 13 inches; black (10YR 2/1) silt loam; moderate very fine subangular blocky structure; friable; neutral; clear smooth boundary.

BA—13 to 19 inches; dark brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; friable; many distinct very dark gray (10YR 3/1) organic films on faces of peds; neutral; clear smooth boundary.

Bt1—19 to 25 inches; dark brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; firm; many distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few distinct very dark grayish brown organic films on faces of peds; slightly acid; clear smooth boundary.

Bt2—25 to 36 inches; dark yellowish brown (10YR 4/4) silty clay loam; common fine distinct grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure; firm; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine rounded black accumulations (iron and manganese oxide); slightly acid; clear smooth boundary.

2Bt3—36 to 42 inches; dark yellowish brown (10YR 4/4) silty clay loam; common fine distinct yellowish brown (10YR 5/8) and light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; firm; few distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine rounded black accumulations (iron and manganese oxide); slightly acid; clear smooth boundary.

2BC—42 to 56 inches; yellowish brown (10YR 4/4) clay loam; common fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common fine irregular black accumulations (iron and manganese oxide); few distinct dark grayish brown (10YR 4/2) clay films on faces of peds; common fine irregular black accumulations (iron and manganese oxide); neutral; clear smooth boundary.

2C—56 to 60 inches; yellowish brown (10YR 5/8) clay loam; many fine distinct grayish brown (10YR 5/2) mottles; massive; very firm; common fine rounded black accumulations (iron and manganese oxide); neutral.

The thickness of the solum ranges from 46 to 60 inches. The thickness of the loess ranges from 35 to 40 inches. The content of clay ranges from 27 to 35 percent in the control section.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The Bt and 2Bt horizons have value of 4 or 5 and chroma of 3 or 4.

Drummer Series

The Drummer series consists of poorly drained, moderately permeable soils on outwash plains or till plains. These soils formed in silty material and in the underlying stratified loamy sediments. Slopes range from 0 to 2 percent.

Drummer soils are similar to Pella and Peotone soils. Pella soils have carbonates within a depth of 40 inches. Peotone soils have a higher content of clay in the subsoil than the Drummer soils. Also, they are cumulic.

Typical pedon of Drummer silty clay loam, 300 feet west and 1,100 feet north of the southeast corner of sec. 10, T. 13 N., R. 9 E.

Ap—0 to 13 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; friable; neutral; clear smooth boundary.

A—13 to 18 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; friable; neutral; clear smooth boundary.

Bg1—18 to 27 inches; dark gray (5Y 4/1) silty clay loam; common fine prominent brownish yellow (10YR 6/6) mottles; moderate medium angular blocky structure; firm; neutral; clear smooth boundary.

Bg2—27 to 42 inches; gray (5Y 5/1) silty clay loam; common medium prominent brownish yellow (10YR 6/6) mottles; moderate medium angular blocky structure; firm; few fine rounded dark accumulations (iron and manganese oxide); neutral; clear smooth boundary.

2BCg—42 to 48 inches; gray (5Y 5/1) silt loam; common medium prominent brownish yellow (10YR 6/6) mottles; moderate medium subangular blocky structure; firm; few fine rounded dark accumulations (iron and manganese oxide); neutral; clear smooth boundary.

2Cg1—48 to 55 inches; gray (5Y 5/1) loam; many medium prominent yellowish brown (10YR 5/6) and brownish yellow (10YR 6/6) mottles; friable; slight effervescence; neutral; abrupt smooth boundary.

2Cg2—55 to 60 inches; yellowish brown (10YR 5/6) fine sandy loam; common medium prominent gray (5Y 5/1) and common medium faint brownish yellow (10YR 6/6) mottles; massive; friable; slight effervescence; neutral.

The thickness of the solum ranges from 42 to 55 inches. The thickness of the overlying silty material ranges from 40 to 48 inches. The depth to free carbonates ranges from 40 to 65 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches. The content of clay ranges from 20 to 35 percent in the control section.

The Ap and A horizons have chroma of 1 or 2. The Bg horizon has hue of 10YR or 5Y, value of 4 to 6, and chroma of 1 to 4. The 2BCg horizon has hue of 10YR or 5Y or is neutral in hue. It has value of 4 to 6 and chroma of 0 to 8. It is typically loam or silt loam, but in some pedons it has strata of silty clay loam or clay loam. The 2Cg horizon is loam, fine sandy loam, loamy sand, clay loam, or silt loam.

Fincastle Series

The Fincastle series consists of somewhat poorly drained soils on till plains. These soils formed in loess and in the underlying loamy glacial till. Permeability is moderate in the upper part of the profile and moderately slow in the lower part. Slopes range from 0 to 2 percent.

Fincastle soils are similar to Starks, Toronto, and Xenia soils. Starks soils formed in loess and loamy outwash. Toronto soils have a surface layer that is darker than that of the Fincastle soils. Xenia soils are moderately well drained.

Typical pedon of Fincastle silt loam, 100 feet south and 1,800 feet west of the northeast corner of sec. 29, T. 14 N., R. 10 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

E—8 to 11 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; few fine distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; few fine rounded dark accumulations (iron and manganese oxide); medium acid; abrupt smooth boundary.

Bt1—11 to 18 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct grayish brown (10YR 5/2) and brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; common distinct grayish brown (10YR 5/2) clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—18 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; common fine and medium distinct brown (7.5YR 4/4) and grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; many distinct grayish brown (10YR 5/2) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); medium acid; clear smooth boundary.

Bt3—24 to 32 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct light brownish gray (10YR 6/2) and common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common distinct grayish brown (10YR 5/2) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); medium acid; clear smooth boundary.

2Bt4—32 to 40 inches; light brownish gray (10YR 6/2) clay loam; common medium distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; few distinct grayish brown (10YR 5/2) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); slightly acid; clear smooth boundary.

2C1—40 to 50 inches; yellowish brown (10YR 5/6) loam; common medium distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; firm; neutral; clear smooth boundary.

2C2—50 to 60 inches; yellowish brown (10YR 5/6) loam; common medium distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) mottles; massive; friable; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 40 to 60 inches. The thickness of the loess ranges from 23 to 34 inches. The content of clay ranges from 23 to 35 percent in the control section.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The E horizon has value of 4 to 6. The Bt and 2Bt horizons have value of 5 or 6 and chroma of 2 to 6. The 2Bt horizon is clay loam or loam. The 2C horizon is loam or clay loam.

Flanagan Series

The Flanagan series consists of somewhat poorly drained soils on till plains and moraines. These soils formed in loess and in the underlying loamy glacial till. Permeability is moderate in the upper part of the profile and moderately slow in the lower part. Slopes range from 0 to 2 percent.

Flanagan soils are similar to Raub soils. Raub soils have less clay in the subsoil than the Flanagan soils. Also, they have glacial till within a depth of 40 inches.

Typical pedon of Flanagan silt loam, 100 feet north

and 1,400 feet east of the southwest corner of sec. 3, T. 13 N., R. 9 E.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; slightly acid; abrupt smooth boundary.

A—8 to 15 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; friable; neutral; clear smooth boundary.

BA—15 to 19 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; friable; many distinct very dark grayish brown (10YR 3/2) coatings on faces of peds; slightly acid; clear smooth boundary.

Bt1—19 to 27 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; firm; few distinct very dark grayish brown (10YR 3/2) coatings and common distinct dark brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—27 to 38 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure; firm; many distinct very dark grayish brown (10YR 3/2) coatings and dark brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt3—38 to 42 inches; brown (10YR 5/3) silty clay loam; many fine distinct grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure; firm; few distinct very dark grayish brown (10YR 3/2) coatings and common distinct dark brown (10YR 4/3) clay films on faces of peds; neutral; clear smooth boundary.

2Bt4—42 to 48 inches; dark yellowish brown (10YR 4/4) clay loam; many fine distinct grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure; firm; few distinct very dark grayish brown (10YR 3/2) coatings and common distinct dark brown (10YR 4/3) clay films on faces of peds; neutral; clear smooth boundary.

2BC—48 to 55 inches; grayish brown (10YR 5/2) loam; many fine distinct dark yellowish brown (10YR 4/4 and 4/6) mottles; weak medium subangular blocky structure; firm; neutral; gradual smooth boundary.

2C—55 to 60 inches; grayish brown (10YR 5/2) loam; many fine distinct dark yellowish brown (10YR 4/4 and 4/6) mottles; massive; firm; neutral.

The thickness of the solum ranges from 44 to 60 inches. The thickness of the loess ranges from 40 to 60 inches. The thickness of the mollic epipedon ranges from 11 to 18 inches. The content of clay ranges from 35 to 42 percent in the control section.

The Ap and A horizons have value of 2 or 3 and chroma of 1 or 2. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 6. The 2Bt and 2BC horizons have value of 4 to 6 and chroma of 1 to 6. They are silt loam, loam, clay loam, or silty clay loam. The 2C horizon is loam, clay loam, silt loam, or silty clay loam.

Landes Series

The Landes series consists of well drained soils on flood plains. These soils formed in loamy alluvial sediments. Permeability is moderately rapid in the upper part of the profile and rapid in the lower part. Slopes range from 0 to 2 percent.

Landes soils are similar to Ross soils. Ross soils have less sand in the control section than the Landes soils.

Typical pedon of Landes fine sandy loam, 2,400 feet east and 800 feet north of the southwest corner of sec. 21, T. 12 N., R. 9 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A1—8 to 12 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

A2—12 to 18 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure parting to weak very fine subangular blocky; friable; neutral; clear smooth boundary.

Bw1—18 to 24 inches; dark brown (10YR 4/3) fine sandy loam; weak medium prismatic structure parting to weak fine subangular blocky; friable; neutral; clear smooth boundary.

Bw2—24 to 30 inches; dark brown (10YR 4/3) loamy fine sand; weak medium subangular blocky structure parting to weak fine subangular blocky; friable; neutral; abrupt smooth boundary.

C—30 to 60 inches; dark brown (10YR 4/3) and dark yellowish brown (10YR 4/4), stratified loamy fine sand and fine sandy loam; massive; very friable; neutral.

The thickness of the solum ranges from 30 to 38

inches. The thickness of the mollic epipedon ranges from 12 to 21 inches.

The Ap and A horizons have value of 2 or 3 and chroma of 1 or 2. The Bw horizon has value of 3 or 4 and chroma of 2 to 4. It is neutral. It is loamy fine sand, fine sandy loam, loam, or sandy loam. The C horizon has value of 4 or 5 and chroma of 3 or 4. It is stratified loamy fine sand, loam, sandy loam, or fine sandy loam.

Lawson Series

The Lawson series consists of somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in silty alluvial material. Slopes range from 0 to 2 percent.

Lawson soils are similar to Ross soils. Ross soils are well drained. They have a higher content of sand in the control section than the Lawson soils.

Typical pedon of Lawson silt loam, 180 feet east and 740 feet south of the northwest corner of sec. 1, T. 11 N., R. 9 E.

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; mildly alkaline; abrupt smooth boundary.

A—11 to 26 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; few fine faint brown (10YR 5/3) and few fine distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure parting to moderate fine granular; firm; neutral; clear smooth boundary.

C1—26 to 41 inches; very dark grayish brown (10YR 3/2) silt loam stratified with thin lenses of brown (10YR 5/3) loam; weak coarse subangular blocky structure; firm; neutral; clear smooth boundary.

C2—41 to 60 inches; very dark grayish brown (10YR 3/2) silt loam; common thin strata of brown (10YR 5/3) loam; friable; few fine rounded dark accumulations (iron and manganese oxide); neutral.

The thickness of the solum and the thickness of the mollic epipedon range from 24 to 36 inches. The content of clay ranges from 18 to 30 percent in the control section.

The Ap and A horizons have value of 2 or 3 and chroma of 1 or 2. The C horizon has value of 3 to 5 and chroma of 1 or 2. It is silt loam or silty clay loam.

Lenzburg Series

The Lenzburg series consists of well drained, moderately slowly permeable soils on uplands. These soils formed in a regolith of spoil from gravel mining activities, sanitary landfill areas, and borrow and fill areas. The regolith is a mixture of fine earth material and fragments of bedrock. Slopes range from 1 to 20 percent.

Typical pedon of Lenzburg loam, 7 to 20 percent slopes, 2,200 feet east and 310 feet north of the southwest corner of sec. 32, T. 13 N., R. 10 E.

Ap—0 to 8 inches; mixed very dark grayish brown (10YR 3/2), gray (10YR 5/1), and dark yellowish brown (10YR 4/4) loam; weak coarse granular structure; firm; few fine roots; few distinct very dark brown (10YR 2/2) organic coatings in channels; about 10 percent gravel; strong effervescence; mildly alkaline; gradual smooth boundary.

C1—8 to 13 inches; mixed dark yellowish brown (10YR 4/4) and dark grayish brown (10YR 4/2) clay loam; massive; firm; very few fine roots; about 10 percent gravel; strong effervescence; mildly alkaline; gradual smooth boundary.

C2—13 to 24 inches; mixed dark brown (10YR 4/3) and dark grayish brown (10YR 4/2) clay loam; massive; very firm; about 10 percent gravel; strong effervescence; mildly alkaline; gradual smooth boundary.

C3—24 to 39 inches; mixed dark brown (10YR 4/3), grayish brown (10YR 5/2), and yellowish brown (10YR 5/6) clay loam; massive; very firm; about 15 percent gravel; strong effervescence; mildly alkaline; gradual smooth boundary.

C4—39 to 60 inches; mixed grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/4) clay loam; massive; very firm; about 13 percent gravel; strong effervescence; mildly alkaline.

The fine earth material contains a few soil fragments from genetic horizons. Rock fragments are commonly gravel, but a few larger stones are included. The content of gravel ranges from 10 to 25 percent, by volume, in the control section.

The Ap or A horizon has chroma of 1 to 4. It is loam or gravelly loam. A few stones are on the surface in most areas. The C horizon has hue of 10YR, 7.5YR, 5Y, 2.5YR, or 5GY; value of 2 to 6; and chroma of 1 to 6. Many of the colors are relic and are not indicative of soil drainage. The C horizon is loam, clay loam, silty clay loam, sandy clay loam, or the gravelly analogs of those textures.

Martinsville Series

The Martinsville series consists of well drained, moderately permeable soils on stream terraces and outwash plains. These soils formed in a thin layer of loess and in the underlying stratified, loamy glacial outwash. Slopes range from 1 to 12 percent.

Martinsville soils are similar to Camden, Miami, and Russell soils. Camden soils formed in a thicker mantle of loess than the Martinsville soils. Miami soils formed mainly in glacial till. Russell soils formed in loess and glacial till.

Typical pedon of Martinsville silt loam, 1 to 5 percent slopes, 100 feet south and 900 feet west of the northeast corner of sec. 29, T. 13 N., R. 10 E.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; slightly acid; abrupt smooth boundary.

Bt1—8 to 18 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; firm; many distinct brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

2Bt2—18 to 28 inches; dark yellowish brown (10YR 4/6) sandy clay loam; moderate medium subangular blocky structure; firm; common distinct brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

2Bt3—28 to 34 inches; strong brown (7.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; firm; few distinct brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

2C1—34 to 43 inches; dark brown (7.5YR 4/4) sandy clay loam; moderate medium subangular blocky structure; firm; few distinct brown (10YR 4/3) clay films on faces of peds; about 5 percent gravel; slightly acid; clear smooth boundary.

2C2—43 to 60 inches; yellowish brown (10YR 5/4), stratified loam and sandy loam; massive; friable; neutral.

The thickness of the solum ranges from 43 to 60 inches. The content of clay ranges from 18 to 33 percent in the control section.

The Ap horizon has value of 3 to 5 and chroma of 3 or 4. It is loam or silt loam. The Bt and 2Bt horizons have value of 4 or 5. They are clay loam, sandy clay loam, silty clay loam, sandy loam, or coarse sandy loam. The 2C horizon is stratified sandy clay loam, sandy loam, or loam.

Miami Series

The Miami series consists of well drained soils in the uplands. These soils formed in loamy glacial till. Permeability is moderate in the upper part of the profile and moderately slow in the lower part. Slopes range from 5 to 60 percent.

Miami soils are similar to Martinsville and Russell soils. Martinsville soils formed mainly in loamy outwash. Russell soils formed in loess and glacial till.

Typical pedon of Miami loam, 10 to 15 percent slopes, eroded, 1,200 feet east and 700 feet north of the southwest corner of sec. 18, T. 11 N., R. 10 E.

Ap—0 to 5 inches; brown (10YR 4/3) loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; slightly acid; abrupt smooth boundary.

E—5 to 9 inches; yellowish brown (10YR 5/4) loam; weak medium platy structure parting to moderate fine granular; friable; very few distinct very dark grayish brown (10YR 3/2) organic coatings lining pores; slightly acid; abrupt smooth boundary.

Bt1—9 to 14 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; very few distinct very dark grayish brown (10YR 3/2) organic coatings lining pores; medium acid; clear smooth boundary.

Bt2—14 to 23 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; firm; few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; very few distinct very dark grayish brown (10YR 3/2) organic coatings lining pores; few fine rounded dark accumulations (iron and manganese oxide); medium acid; clear smooth boundary.

Bt3—23 to 28 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; firm; few distinct brown (10YR 4/3) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); neutral; clear smooth boundary.

C—28 to 60 inches; yellowish brown (10YR 5/4) loam; massive; firm; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 24 to 42 inches. The content of clay ranges from 25 to 35 percent in the control section.

The Ap horizon has value of 3 to 5 and chroma of 1 to 3. It is loam, clay loam, or sandy loam. The E horizon has value of 4 to 6 and chroma of 2 to 4. Some pedons do not have an E horizon. The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6.

Millbrook Series

The Millbrook series consists of somewhat poorly drained, moderately permeable soils on outwash plains. These soils formed in loess and in the underlying loamy

outwash. Slopes range from 0 to 2 percent.

Millbrook soils are similar to Brenton and Toronto soils. Brenton soils have a mollic epipedon. Toronto soils formed in loess and glacial till.

Typical pedon of Millbrook silt loam, 80 feet south and 1,960 feet east of the northwest corner of sec. 22, T. 11 N., R. 7 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; slightly acid; abrupt smooth boundary.

E—8 to 14 inches; brown (10YR 5/3) silt loam, light gray (10YR 7/2) dry; common medium faint dark grayish brown (10YR 5/2) mottles; moderate thin platy structure; friable; few fine rounded dark accumulations (iron and manganese oxide); medium acid; abrupt smooth boundary.

Bt1—14 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct yellowish brown (10YR 5/8) and few fine distinct grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; firm; few distinct grayish brown (10YR 5/2) clay films on faces of peds; common prominent light gray (10YR 7/1) silt coatings on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); strongly acid; clear smooth boundary.

Bt2—20 to 32 inches; grayish brown (10YR 5/2) silty clay loam; many fine and medium prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; common distinct gray (10YR 5/1) and dark grayish brown (10YR 4/2) clay films on faces of peds; few prominent light gray (10YR 7/1) silt coatings on faces of peds; many distinct very dark grayish brown (10YR 3/2) clay films in root channels; few fine rounded dark accumulations (iron and manganese oxide); medium acid; clear smooth boundary.

2Bt3—32 to 40 inches; light brownish gray (10YR 6/2) clay loam; many fine and medium prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; common distinct grayish brown (10YR 5/2) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); medium acid; clear smooth boundary.

2BC—40 to 52 inches; grayish brown (10YR 5/2) clay loam; common medium prominent yellowish brown (10YR 5/6), common fine faint light brownish gray (10YR 6/2), and common fine distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; firm; few fine rounded dark accumulations (iron and manganese oxide); neutral; clear smooth boundary.

2C—52 to 60 inches; dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6), stratified clay loam, sandy clay loam, and silt loam; few medium distinct grayish brown (10YR 5/2) mottles; massive; friable; neutral.

The thickness of the solum ranges from 41 to 55 inches. The thickness of the overlying loess ranges from 22 to 40 inches.

The Ap horizon has chroma of 2. The E horizon has value of 4 to 6. The 2Bt and 2BC horizons have value of 4 to 6 and chroma of 1 to 4. The 2C horizon is stratified sandy loam, loam, sandy clay loam, silt loam, or clay loam.

Pella Series

The Pella series consists of poorly drained, moderately permeable soils on outwash plains and till plains. These soils formed in loess and in the underlying loamy sediments. Slopes range from 0 to 2 percent.

Pella soils are similar to Drummer soils. Drummer soils do not have carbonates within a depth of 40 inches.

Typical pedon of Pella silty clay loam, 2,600 feet west and 2,600 feet south of the northeast corner of sec. 30, T. 13 N., R. 10 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A—9 to 14 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark gray (10YR 4/1) dry; moderate medium granular structure; firm; neutral; clear smooth boundary.

Bg1—14 to 19 inches; dark gray (10YR 4/1) silty clay loam; moderate medium subangular blocky structure; firm; common distinct very dark grayish brown (10YR 3/2) organic films on faces of peds; neutral; clear smooth boundary.

Bg2—19 to 25 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; common distinct very dark grayish brown (10YR 3/2) organic films on faces of peds; neutral; clear smooth boundary.

Bg3—25 to 31 inches; dark gray (10YR 4/1) silty clay loam; many medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; few distinct very dark grayish brown

(10YR 3/2) organic films on faces of peds; neutral; clear smooth boundary.

2BCg—31 to 40 inches; gray (10YR 6/1) silt loam; many medium prominent yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; strong effervescence; mildly alkaline; clear smooth boundary.

2Cg—40 to 60 inches; gray (10YR 6/1), stratified loam and silty clay loam; many medium prominent yellowish brown (10YR 5/6) mottles; massive; firm; violent effervescence; mildly alkaline.

The thickness of the solum ranges from 27 to 48 inches. The thickness of the overlying silty material ranges from 29 to 40 inches. The depth to free carbonates ranges from 19 to 35 inches. The thickness of the mollic epipedon ranges from 12 to 17 inches.

The Ap and A horizons have hue of 10YR or are neutral in hue. They have value of 2 or 3 and chroma of 0 to 2. The Bg horizon has hue of 10YR or 5Y, value of 4 to 6, and chroma of 1 or 2. The 2BCg horizon has hue of 5Y or 10YR, value of 6 or 7, and chroma of 1 or 2. It is silt loam or silty clay loam.

Peotone Series

The Peotone series consists of very poorly drained, moderately slowly permeable soils in depressions on outwash plains and till plains. These soils formed in silty sediments. Slopes range from 0 to 2 percent.

Peotone soils are similar to Drummer soils. Drummer soils have less clay in the control section than the Peotone soils. Also, they are not cumulic.

Typical pedon of Peotone silty clay loam, 100 feet east and 100 feet south of the northwest corner of sec. 12, T. 13 N., R. 8 E.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak medium angular blocky structure; firm; neutral; abrupt smooth boundary.

A—9 to 15 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine angular blocky structure; firm; neutral; clear smooth boundary.

Bg1—15 to 20 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; weak medium angular blocky structure; firm; many distinct black (10YR 2/1) organic films on faces of peds; mildly alkaline; clear smooth boundary.

Bg2—20 to 26 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; weak medium angular blocky structure; firm; common distinct black (10YR 2/1) organic films on faces of peds; mildly alkaline; clear smooth boundary.

Bg3—26 to 35 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; firm; common distinct very dark gray (10YR 3/1) clay films on faces of peds; mildly alkaline; gradual smooth boundary.

BCg—35 to 40 inches; gray (10YR 5/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; many coarse rounded very dark gray (10YR 3/1) krotovinas; slight effervescence; mildly alkaline; clear smooth boundary.

Cg—40 to 60 inches; dark gray (5Y 4/1) silt loam; many medium prominent yellowish brown (10YR 5/8) mottles; massive; firm; many coarse rounded very dark gray (10YR 3/1) krotovinas; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 40 to 60 inches. The thickness of the mollic epipedon ranges from 26 to 30 inches. The content of clay ranges from 35 to 45 percent in the 10- to 40-inch control section.

The Ap and A horizons have value of 2 or 3. The Bg horizon has hue of 10YR or 2.5Y, value of 2 to 5, and chroma of 1 or 2.

Proctor Series

The Proctor series consists of well drained, moderately permeable soils on outwash plains and stream terraces. These soils formed in loess and in the underlying loamy outwash. Slopes range from 1 to 5 percent.

Proctor soils are similar to Dana soils. Dana soils formed in loess and glacial till.

Typical pedon of Proctor silt loam, 1 to 5 percent slopes, 300 feet south and 1,620 feet west of the northeast corner of sec. 23, T. 11 N., R. 9 E.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine granular structure; friable; slightly acid; clear smooth boundary.

BA—10 to 16 inches; dark brown (10YR 3/3) silt loam, grayish brown (10YR 5/2) dry; moderate very fine subangular blocky structure; friable; few distinct very dark gray (10YR 3/1) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt1—16 to 22 inches; brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; firm; common distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—22 to 29 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky

structure; firm; common distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt3—29 to 35 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; few distinct dark brown (10YR 3/3) clay films on faces of peds; slightly acid; clear smooth boundary.

2Bt4—35 to 40 inches; yellowish brown (10YR 5/6) clay loam; few fine prominent grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few distinct dark brown (10YR 3/3) clay films on faces of peds; slightly acid; clear smooth boundary.

2Bt5—40 to 58 inches; yellowish brown (10YR 5/6) sandy clay loam; few medium distinct dark brown (10YR 3/3) mottles; moderate coarse subangular blocky structure; firm; very few distinct brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

2BC—58 to 60 inches; dark brown (7.5YR 4/4) sandy clay loam; weak coarse subangular blocky structure; firm; very few distinct brown (10YR 4/3) clay films on faces of peds; slightly acid.

The thickness of the solum ranges from 52 to 60 inches. The thickness of the overlying silty material ranges from 24 to 40 inches. The thickness of the mollic epipedon ranges from 13 to 16 inches.

The Ap horizon has value and chroma of 2 or 3. The 2Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is clay loam, loam, or sandy clay loam. The 2BC horizon has hue of 7.5YR or 10YR, value of 4, and chroma of 4 to 6. It is sandy loam or sandy clay loam.

Raub Series

The Raub series consists of somewhat poorly drained, moderately slowly permeable soils on till plains and moraines. These soils formed in loess and in the underlying calcareous loam till. Slopes range from 0 to 2 percent.

Raub soils are similar to Brenton and Flanagan soils. Brenton soils formed in loess and glacial outwash. Flanagan soils formed in a thicker mantle of loess than the Raub soils. Also, they have more clay in the upper part of the subsoil.

Typical pedon of Raub silt loam, 10 feet north and 1,800 feet west of the southeast corner of sec. 34, T. 13 N., R. 8 E.

Ap—0 to 12 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine granular structure; friable; slightly acid; abrupt smooth boundary.

Bt1—12 to 16 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate very fine subangular blocky structure; firm; many distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; friable; slightly acid; clear smooth boundary.

Bt2—16 to 25 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct dark grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common distinct very dark grayish brown (10YR 3/2) organic coatings and few distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); slightly acid; clear smooth boundary.

Bt3—25 to 29 inches; yellowish brown (10YR 5/4) silty clay loam; common fine faint yellowish brown (10YR 5/6) and common fine distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; common distinct very dark grayish brown (10YR 3/2) organic films on faces of peds; common distinct brown (10YR 5/3) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); neutral; clear smooth boundary.

2Bt4—29 to 36 inches; yellowish brown (10YR 5/6) silty clay loam; many fine and medium grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few distinct brown (10YR 5/3) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); neutral; clear smooth boundary.

2BC—36 to 47 inches; yellowish brown (10YR 5/6) loam; many fine and medium grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; few fine rounded dark accumulations (iron and manganese oxide); about 1 percent pebbles; neutral; clear smooth boundary.

2C—47 to 60 inches; yellowish brown (10YR 5/4) loam; common fine and medium distinct yellowish brown (10YR 5/6) and many fine and medium grayish brown (10YR 5/2) mottles; massive; firm; common fine rounded dark accumulations (iron and manganese oxide); slight effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 40 to 60 inches. The thickness of the loess ranges from 22 to 40 inches. The thickness of the mollic epipedon ranges from 11 to 16 inches. The content of clay ranges from 27 to 35 percent in the control section.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The Bt and 2Bt horizons have chroma of 3 to 6. The 2C horizon is silt loam, loam, silty clay loam, or clay loam.

Ross Series

The Ross series consists of well drained, moderately permeable soils on flood plains and low stream terraces. These soils formed in stratified loamy alluvium. Slopes range from 0 to 2 percent.

Ross soils are similar to Lawson soils. Lawson soils are somewhat poorly drained. They have a lower content of sand in the control section than the Ross soils.

Typical pedon of Ross loam, 100 feet north and 1,160 feet west of the southeast corner of sec. 14, T. 11 N., R. 9 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) loam, dark gray (10YR 4/2) dry; moderate fine granular structure; friable; neutral; clear smooth boundary.

A—7 to 15 inches; very dark grayish brown (10YR 3/2) loam; grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; neutral; clear smooth boundary.

Bw1—15 to 27 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

Bw2—27 to 38 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

Bw3—38 to 44 inches; dark yellowish brown (10YR 4/4) loam; weak medium subangular blocky structure; friable; few distinct dark brown (10YR 3/3) organic coatings on faces of peds; neutral; clear smooth boundary.

C—44 to 60 inches; dark yellowish brown (10YR 4/4) loam; massive; friable; neutral.

The thickness of the solum ranges from 39 to 60 inches. The thickness of the mollic epipedon ranges from 24 to 40 inches.

The Ap and A horizons have value of 2 or 3 and chroma of 1 to 3. The Bw horizon has value of 3 to 5 and chroma of 2 to 4. It is loam or fine sandy loam. The C horizon is loam, sandy loam, or loamy sand. It is stratified in some pedons.

Russell Series

The Russell series consists of well drained, moderately permeable soils on till plains. These soils formed in loess and in the underlying calcareous loamy till. Slopes range from 1 to 10 percent.

Russell soils are similar to Camden, Miami, and Xenia soils. Camden soils formed in loess and glacial outwash. Miami soils formed mainly in glacial till. Xenia soils are moderately well drained.

Typical pedon of Russell silt loam, 1 to 5 percent slopes, 1,400 feet west and 900 feet south of the northeast corner of sec. 10, T. 11 N., R. 9 E.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; slightly acid; abrupt smooth boundary.

BA—7 to 12 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; weak medium subangular blocky structure; friable; few distinct brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt1—12 to 21 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; common distinct brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—21 to 31 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; common distinct brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

2Bt3—31 to 46 inches; brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; firm; common distinct brown (10YR 4/3) clay films on faces of peds; about 5 percent gravel; medium acid; clear smooth boundary.

2BC—46 to 60 inches; brown (7.5YR 4/4) sandy clay loam; weak medium subangular blocky structure; friable; few distinct brown (10YR 4/3) clay films on faces of peds; about 5 percent gravel; slightly acid.

The thickness of the solum and the depth to carbonates range from 47 to 60 inches. The thickness of the loess ranges from 27 to 35 inches. The content of clay ranges from 25 to 33 percent in the control section.

The Ap horizon has value of 3 or 4 and chroma of 2 or 3. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The 2Bt horizon is clay loam, loam, or sandy clay loam.

Sawmill Series

The Sawmill series consists of poorly drained, moderately permeable soils on flood plains. These soils formed in silty alluvial material. Slopes range from 0 to 2 percent.

Sawmill soils are similar to Lawson soils. Lawson soils are somewhat poorly drained.

Typical pedon of Sawmill silty clay loam, 500 feet east and 900 feet south of the northwest corner of sec. 21, T. 12 N., R. 9 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

A1—8 to 16 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure; firm; neutral; clear smooth boundary.

A2—16 to 26 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; few fine faint dark brown (10YR 4/3) mottles; weak fine prismatic structure parting to moderate very fine and fine angular blocky; firm; few fine rounded dark accumulations (iron and manganese oxide); neutral; gradual smooth boundary.

Btg1—26 to 38 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct dark brown (10YR 4/3) and common fine prominent dark brown (7.5YR 4/4) mottles; weak medium prismatic structure parting to moderate medium and fine angular blocky; firm; many distinct dark gray (N 4/0) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); neutral; gradual smooth boundary.

Btg2—38 to 54 inches; dark gray (10YR 4/1) silty clay loam; few fine distinct pale brown (10YR 6/3) and dark brown (7.5YR 4/4) mottles; weak medium prismatic structure parting to moderate medium angular blocky; firm; many distinct gray (N 4/0) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); neutral; gradual smooth boundary.

Cg—54 to 60 inches; dark gray (10YR 4/1) silty clay loam; common fine prominent dark brown (7.5YR 4/4) mottles; massive; firm; few fine rounded dark accumulations (iron and manganese oxide); mildly alkaline.

The thickness of the solum ranges from 36 to 60 inches. The thickness of the mollic epipedon ranges from 24 to 36 inches. The content of clay ranges from 25 to 35 percent in the control section.

The Ap and A horizons have hue of 10YR or 5YR or are neutral in hue. They have value of 2 or 3 and chroma of 0 to 2.

Shoals Series

The Shoals series consists of somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in loamy alluvium. Slopes range from 0 to 2 percent.

Shoals soils are similar to Wirt and Landes soils. Wirt soils are well drained. Landes soils have a higher content of clay in the control section than the Shoals soils.

Typical pedon of Shoals loam, 300 feet west and 2,000 feet south of the northeast corner of sec. 21, T. 12 N., R. 9 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) loam; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

C1—9 to 16 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct light brownish gray (10YR 6/2) mottles; moderate thin platy structure; friable; few distinct brown (10YR 4/3) coatings on faces of peds; mildly alkaline; clear smooth boundary.

C2—16 to 22 inches; grayish brown (10YR 5/2) silt loam; few medium faint light brownish gray (10YR 6/2) and many medium prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; few distinct brown (10YR 4/3) coatings on faces of peds; neutral; clear smooth boundary.

C3—22 to 36 inches; grayish brown (10YR 5/2) loam; few medium faint gray (10YR 5/1) and many medium prominent yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; friable; neutral; clear smooth boundary.

C4—36 to 60 inches; grayish brown (10YR 5/2) loam that has strata of clay loam; many medium prominent strong brown (7.5YR 4/6) mottles; massive; friable; common distinct dark grayish brown (10YR 4/2) coatings in channels; few fine irregular accumulations (iron and manganese oxide); neutral.

The content of clay ranges from 18 to 33 percent in the control section. The Ap horizon has chroma of 2 or 3. The C horizon has value of 4 or 5 and chroma of 2 to 4.

Starks Series

The Starks series consists of somewhat poorly drained, moderately permeable soils on outwash plains and stream terraces. These soils formed in loess and in the underlying loamy outwash. Slopes range from 0 to 5 percent.

Starks soils are similar to Fincastle soils. Fincastle soils formed in loess and till.

Typical pedon of Starks silt loam, 0 to 2 percent slopes, 600 feet east and 1,300 feet north of the southwest corner of sec. 17, T. 11 N., R. 7 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate very fine granular structure; friable; slightly acid; abrupt smooth boundary.

E—8 to 13 inches; brown (10YR 5/3) silt loam; few fine faint dark yellowish brown (10YR 4/4) mottles; moderate thin platy structure parting to moderate very fine granular; friable; common distinct light brownish gray (10YR 6/2) and light gray (10YR 7/2) silt coatings on faces of peds; medium acid; clear smooth boundary.

Bt1—13 to 21 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct yellowish brown (10YR 5/8) and few fine distinct grayish brown (10YR 5/2) mottles; weak fine prismatic structure parting to moderate fine and medium subangular blocky; firm; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; common distinct light gray (10YR 7/2) silt coatings on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); medium acid; clear smooth boundary.

Bt2—21 to 26 inches; brown (10YR 5/3) silty clay loam; many fine prominent yellowish brown (10YR 5/8) and common fine faint light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; firm; common distinct grayish brown (10YR 5/2) clay films on faces of peds; common distinct light gray (10YR 6/1) silt coatings on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); medium acid; clear smooth boundary.

Bt3—26 to 36 inches; grayish brown (10YR 5/2) silty clay loam; many medium prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; very few distinct light gray (10YR 6/1) silt coatings on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); medium acid; clear smooth boundary.

2Bt4—36 to 44 inches; grayish brown (10YR 5/2) sandy loam; common medium prominent dark brown (7.5YR 4/4) mottles; medium coarse subangular blocky structure; firm; few distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); about 3 percent gravel; medium acid; clear smooth boundary.

2C—44 to 60 inches; dark yellowish brown (10YR 4/4) sandy loam; massive; firm; common rounded dark accumulations (iron and manganese oxide); neutral.

The thickness of the solum ranges from 40 to more than 60 inches. The thickness of the overlying loess ranges from 27 to 40 inches. The content of clay ranges from 27 to 35 percent in the control section.

The Ap and E horizons have value of 4 or 5 and chroma of 2 or 3. The Bt and 2Bt horizons have value of 4 or 5. The 2Bt horizon is clay loam, loam, or sandy loam. The 2C horizon is sandy loam, loamy sand, loam, silt loam, or clay loam.

Thorp Series

The Thorp series consists of poorly drained, slowly permeable soils on outwash plains. These soils formed in loess and in the underlying stratified loamy outwash. Slopes range from 0 to 2 percent.

The Thorp soils in this survey area have a higher content of sand and coarse fragments in the Bt horizon than is definitive for the series. This difference, however, does not significantly affect the use or behavior of the soils.

Typical pedon of Thorp silt loam, 650 feet north and 1,400 feet east of the southwest corner of sec. 18, T. 11 N., R. 7 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine granular structure; friable; neutral; abrupt smooth boundary.

A—8 to 13 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

Eg—13 to 19 inches; grayish brown (10YR 5/2) silt loam, light brownish gray (10YR 6/2) dry; common fine distinct yellowish brown (10YR 5/4) mottles; weak thin platy structure parting to weak fine granular; friable; neutral; abrupt smooth boundary.

Btg1—19 to 25 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; many distinct dark grayish brown (10YR 4/2) and few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; about 2 percent gravel; neutral; clear smooth boundary.

Btg2—25 to 32 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent yellowish brown (10YR 5/8) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm; common faint grayish brown (10YR 5/2) and few distinct dark gray (10YR 4/1) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); about 2 percent gravel; neutral; clear smooth boundary.

Btg3—32 to 40 inches; light brownish gray (10YR 6/2)

silty clay loam; many fine and medium prominent yellowish brown (10YR 5/8) mottles; weak fine prismatic structure parting to moderate medium and coarse subangular blocky; firm; few distinct dark grayish brown (10YR 4/2) and common distinct grayish brown (10YR 5/2) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); about 2 percent gravel; neutral; clear smooth boundary.

2Btg4—40 to 49 inches; light brownish gray (10YR 6/2) clay loam; many fine and medium prominent yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to moderate coarse subangular blocky; friable; few distinct grayish brown (10YR 5/2) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); about 2 percent gravel; neutral; clear smooth boundary.

2Cg—49 to 60 inches; grayish brown (10YR 5/2) loam; common medium prominent strong brown (7.5YR 5/6) mottles; massive; friable; few fine rounded dark accumulations (iron and manganese oxide); 10 to 14 percent gravel; mildly alkaline.

The thickness of the solum ranges from 46 to 60 inches. The thickness of the overlying silty material ranges from 36 to 50 inches.

The Ap and A horizons have value of 2 or 3 and chroma of 1 or 2. The Eg horizon has value of 4 or 5 and chroma of 1 or 2. The Btg and 2Btg horizons have hue of 10YR or 5Y, value of 4 to 6, and chroma of 1 or 2. The 2Btg horizon is silt loam or clay loam. The 2Cg horizon is silt loam, clay loam, or loam.

Tice Series

The Tice series consists of somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Tice soils are similar to Lawson soils. Lawson soils have a thicker mollic epipedon than the Tice soils.

Typical pedon of Tice silty clay loam, 800 feet west and 400 feet north of the southeast corner of sec. 11, T. 11 N., R. 9 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

A—7 to 13 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; firm; neutral; clear smooth boundary.

Bw1—13 to 20 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; moderate fine subangular blocky structure; firm; few distinct dark gray (10YR 4/1) organic coatings on faces of peds; neutral; clear smooth boundary.

Bw2—20 to 31 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; moderate medium angular blocky structure; firm; many distinct dark gray (10YR 4/1) coatings on faces of peds; neutral; clear smooth boundary.

Bw3—31 to 42 inches; dark brown (10YR 4/3) silty clay loam; many fine faint grayish brown (10YR 5/2) and common fine faint yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; few distinct dark grayish brown (10YR 4/2) coatings on faces of peds; neutral; clear smooth boundary.

BC—42 to 48 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few distinct dark gray (10YR 4/1) coatings on faces of peds; neutral; clear smooth boundary.

C—48 to 60 inches; grayish brown (10YR 5/2) silty clay loam; common fine and medium faint dark grayish brown (10YR 4/2) and common fine distinct yellowish brown (10YR 5/4) mottles; massive; firm; neutral.

The thickness of the solum ranges from 30 to 60 inches. The thickness of the mollic epipedon ranges from 10 to 15 inches.

The Ap and A horizons have value of 2 or 3 and chroma of 1 to 3. The Bw horizon has value of 4 or 5 and chroma of 2 to 4. The C horizon has value of 4 to 6 and chroma of 1 to 3.

Toronto Series

The Toronto series consists of somewhat poorly drained soils on till plains. These soils formed in loess and in the underlying loamy glacial till. Permeability is moderate in the upper part of the profile and moderately slow in the lower part. Slopes range from 0 to 2 percent.

Toronto soils are similar to Fincastle soils. Fincastle soils have a lighter colored surface layer than the Toronto soils.

Typical pedon of Toronto silt loam, 200 feet east and 960 feet north of the southwest corner of sec. 17, T. 11 N., R. 9 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine

granular structure; friable; slightly acid; abrupt smooth boundary.

Bt—8 to 14 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct grayish brown (10YR 5/2) and common fine faint yellowish brown (10YR 5/8) mottles; moderate fine subangular blocky structure; firm; common distinct dark brown (10YR 4/3) clay films on faces of peds; very few distinct very dark grayish brown (10YR 3/2) organic films in root channels; strongly acid; clear smooth boundary.

Btg1—14 to 22 inches; light brownish gray (10YR 6/2) silty clay loam; many fine prominent yellowish brown (10YR 5/8) mottles; moderate fine angular blocky structure; firm; common distinct grayish brown (10YR 5/2) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); medium acid; clear smooth boundary.

Btg2—22 to 32 inches; light brownish gray (10YR 6/2) silty clay loam; many fine prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; common distinct grayish brown (10YR 5/2) clay films on faces of peds; few distinct dark gray (10YR 4/1) clay films in root channels; few fine rounded dark accumulations (iron and manganese oxide); slightly acid; clear smooth boundary.

Btg3—32 to 37 inches; light brownish gray (10YR 6/2) silty clay loam; many fine prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; few distinct grayish brown (10YR 5/2) clay films on faces of peds; few distinct dark gray (10YR 4/1) clay films in root channels; few fine rounded dark accumulations (iron and manganese oxide); neutral; clear smooth boundary.

2BCg—37 to 44 inches; light brownish gray (10YR 6/2) loam; many fine prominent yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; firm; few fine rounded dark accumulations (iron and manganese oxide); neutral; clear smooth boundary.

2Cg—44 to 60 inches; yellowish brown (10YR 5/8) loam; many fine prominent light brownish gray (10YR 6/2) mottles; massive; firm; few fine rounded dark accumulations (iron and manganese oxide); slight effervescence; mildly alkaline.

The thickness of the solum ranges from 40 to 50 inches. The thickness of the overlying loess ranges from 25 to 37 inches. The content of clay ranges from 27 to 35 percent in the control section.

The Ap horizon has chroma of 1 or 2. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4. The Btg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4. The 2Cg horizon is loam or clay loam.

Wingate Series

The Wingate series consists of moderately well drained soils on till plains and moraines. These soils formed in loess and in the underlying loamy glacial till. Permeability is moderate in the upper part of the profile and moderately slow in the lower part. Slopes range from 2 to 5 percent.

Wingate soils are similar to Proctor soils. Proctor soils formed in loess and glacial outwash. Also, they have a mollic epipedon.

Typical pedon of Wingate silt loam, 2 to 5 percent slopes, 150 feet west and 1,200 feet south of the northeast corner of sec. 7, T. 11 N., R. 7 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

BA—8 to 11 inches; dark brown (10YR 4/3) silt loam; moderate medium granular structure; friable; common distinct very dark grayish brown (10YR 3/2) films on faces of peds; medium acid; clear smooth boundary.

Bt1—11 to 16 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; common distinct dark brown (10YR 4/3) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt2—16 to 25 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium angular blocky structure; firm; common distinct dark brown (10YR 4/3) clay films on faces of peds; common fine rounded dark accumulations (iron and manganese oxide); slightly acid; clear smooth boundary.

Bt3—25 to 31 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; common distinct dark brown (10YR 4/3) clay films on faces of peds; common fine rounded dark accumulations (iron and manganese oxide); strongly acid; clear smooth boundary.

2Bt4—31 to 38 inches; yellowish brown (10YR 5/4) clay loam; common fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; common distinct dark brown (10YR 4/3) clay films on faces of peds; common fine rounded dark accumulations (iron and manganese

oxide); strongly acid; clear smooth boundary.

2BC—38 to 46 inches; dark yellowish brown (10YR 4/4) loam; weak coarse subangular blocky structure; firm; few distinct dark brown (10YR 4/3) clay films on faces of peds; common fine rounded dark accumulations (iron and manganese oxide); neutral; clear smooth boundary.

2C—46 to 60 inches; dark yellowish brown (10YR 4/4) loam; massive; firm; common fine rounded dark accumulations (iron and manganese oxide); neutral.

The thickness of the solum ranges from 46 to 54 inches. The thickness of the loess ranges from 29 to 40 inches. The content of clay ranges from 27 to 35 percent in the control section.

The Bt horizon has chroma of 4 to 6. The 2Bt horizon is loam or clay loam.

Wirt Series

The Wirt series consists of well drained soils on flood plains. These soils formed in loamy alluvium. Permeability is moderate in the upper part of the profile and moderately rapid in the lower part. Slopes range from 0 to 2 percent.

Wirt soils are similar to Landes soils. Landes soils have a higher content of clay in the control section than the Wirt soils.

Typical pedon of Wirt silt loam, 390 feet west and 540 feet south of the northeast corner of sec. 14, T. 11 N., R. 9 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; neutral; abrupt smooth boundary.

Bw1—9 to 23 inches; dark brown (10YR 4/3) silt loam; weak fine and medium subangular blocky structure; friable; common distinct dark brown (10YR 3/3) coatings on faces of peds; neutral; clear smooth boundary.

Bw2—23 to 32 inches; dark yellowish brown (10YR 4/4) loam; weak medium subangular blocky structure; firm; common distinct dark brown (10YR 3/3) coatings on faces of peds; mildly alkaline; clear smooth boundary.

C—32 to 60 inches; brown (10YR 5/3) and dark yellowish brown (10YR 4/4), stratified loam, sandy loam, and silt loam; massive; friable; slight effervescence in the lower part; mildly alkaline.

The content of clay ranges from 18 to 27 percent in the control section. The Ap horizon has value of 3 or 4 and chroma of 2 or 3. The Bw horizon has value of 3 to 5 and chroma of 3 to 6. The C horizon has chroma of 2 to 4.

Xenia Series

The Xenia series consists of moderately well drained, moderately slowly permeable soils on till plains. These soils formed in loess and in the underlying calcareous loamy till. Slopes range from 1 to 5 percent.

Xenia soils are similar to Camden, Fincastle, and Russell soils. Camden soils formed in loess and glacial outwash. Fincastle soils are somewhat poorly drained. Russell soils are well drained.

Typical pedon of Xenia silt loam, 1 to 5 percent slopes, 2,280 feet east and 2,440 feet north of the southwest corner of sec. 7, T. 11 N., R. 9 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; medium acid; abrupt smooth boundary.

E—6 to 9 inches; grayish brown (10YR 5/2) silt loam, pale brown (10YR 6/3) dry; moderate medium platy structure; friable; medium acid; abrupt smooth boundary.

BE—9 to 15 inches; yellowish brown (10YR 5/6) silt loam; moderate medium angular blocky structure; firm; few faint grayish brown (10YR 5/2) clay films on faces of peds; medium acid; clear smooth boundary.

Bt1—15 to 22 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common distinct dark yellowish brown (10YR 4/4) clay films and light brownish gray (10YR 6/2) silt coatings on faces of peds; medium acid; clear smooth boundary.

Bt2—22 to 30 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common distinct light brownish gray (10YR 6/2) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); medium acid; clear smooth boundary.

2Bt3—30 to 36 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint dark yellowish brown (10YR 4/4) and common medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; common distinct dark brown (10YR 4/3) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); neutral; clear smooth boundary.

2Bt4—36 to 47 inches; yellowish brown (10YR 5/4) clay loam; common medium faint dark yellowish brown

(10YR 4/4) and distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few distinct dark brown (10YR 4/3) clay films on faces of peds; few fine rounded dark accumulations (iron and manganese oxide); neutral; clear smooth boundary.

2C1—47 to 54 inches; dark yellowish brown (10YR 4/4) loam; many medium distinct grayish brown (10YR 5/2) and faint yellowish brown (10YR 5/4) mottles; massive; slight effervescence; mildly alkaline; clear smooth boundary.

2C2—54 to 60 inches; brown (10YR 5/3) loam; many medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; massive; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 39 to 57 inches. The thickness of the loess ranges from 28 to 39 inches. The content of clay ranges from 27 to 35 percent in the control section.

The Ap and E horizons have chroma of 2 or 3. The Bt and 2Bt horizons have value of 4 or 5 and chroma of 4 to 6. The 2Bt horizon is silty clay loam, clay loam, or loam.

Formation of the Soils

Soil forms through processes that act on deposited or accumulated geologic material *(7)*. These processes result in features called soil characteristics. The soil characteristics at any given point are determined by the physical and mineralogical composition of the parent material; the plant and animal life on and in the soil; the relief, or lay of the land; the climate under which the soil material has accumulated and existed since accumulation; and the length of time that the forces of soil formation have acted on the parent material.

Climate and plant and animal life are the active factors of soil formation. They act directly on the parent material either in place or after relocation by water, glaciers, or wind and slowly change it into a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material affects the kind of soil profile that forms and, in a few areas, determines it almost entirely. Finally, time is needed for the transformation of the parent material into a soil that has differentiated horizons. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects of any one factor unless the effects of the other factors are considered.

Parent Material

Parent material is the unconsolidated geologic material in which a soil forms. It determines the chemical and mineralogical composition of the soil. The dominant kinds of parent material in Coles County are glacial till, glacial outwash, loess, and alluvium. In some areas the material was reworked and redeposited by subsequent actions of water and wind. Although all of the parent material in the county is of common glacial origin, its properties vary greatly, sometimes within small areas, depending on how the material was deposited.

Glacial till is material laid down directly by glaciers with a minimum of water action. It consists of mixed particles of different sizes. The glacial till in Coles County is firm, calcareous loam or clay loam.

Three major ice advances covered the area that is now Coles County. These were the Kansan, Illinoian, and Wisconsinan glaciations. The Wisconsinan glaciation is the most recent. It covered most of the Illinoian and Kansan glaciations, except in the southeast and southwest corners of the county, and was the dominant influence on the present topography of the survey area and on the material from which the present soils formed. Of the substages of the Wisconsinan glaciation, only the Woodfordian substage extended into the survey area, between about 22,000 and 12,500 years ago *(14)*. Ice sheets of the Decatur sublobe of the Erie lobe invaded the survey area from the east, and some research indicates that glacial drifts also came from the north and northeast *(8, 14)*. The Shelbyville drift in the southern part of the county, the Cerro Gordo in the central part, and the Arcola in the northern part are associated with the Erie lobe of the Wisconsinan glacier. The Woodfordian substage is characterized by innumerable advances and retreats that left a series of moraines, till plains, and outwash areas. The moraines in the survey area are the oldest of the Woodfordian substage *(14)*.

The somewhat poorly drained Fincastle and moderately well drained Xenia soils formed in loess and in the underlying clay loam glacial till in the nearly level and gently sloping areas of the Shelbyville and Paris Moraines and on uplands bordering the major streams. The well drained Miami soils formed in clay loam glacial till and are in moderately sloping to very steep areas on moraines on side slopes along the Embarras and Kaskaskia Rivers and Brush Creek. The nearly level and gently sloping Dana, Raub, Toronto, and Wingate soils formed in loess and in the underlying glacial till. They are on the Cerro Gordo and Arcola Moraines and also on slight rises on till plains.

Glacial outwash is material deposited by meltwater from glaciers. The material is stratified, and individual layers generally have particles of similar size. The size of the particles varies, depending on the velocity of the moving water that deposited them. When the water slowed down, the coarser textured material was

deposited first. The finer textured particles, such as very fine sand, silt, and clay, were carried a greater distance by more slowly moving water. Brenton, Camden, Proctor, and Starks soils formed in loess and glacial outwash deposited near moraines or low stream terraces. The poorly drained Drummer and Pella soils formed in loess and outwash deposits in the lower areas on till plains.

Loess is material deposited by the wind. After the glaciers receded and the major river valleys dried, loess was deposited as a blanket over the county. The main source of loess was from the flood plains of the Illinois and Mississippi Rivers. The thickness of the loess in Coles County ranges from virtually zero on some moderately sloping to very steep side slopes to about 4 feet in the nearly level areas on uplands. Most of the soils in the county formed partially in loess and in the underlying glacial till or outwash.

Alluvium is material that was deposited by floodwater from streams. It varies in texture depending on the velocity of the moving water. Landes, Lawson, Ross, Sawmill, Tice, and Wirt are examples of soils that formed in alluvium. Sawmill and Tice soils are dominantly silty clay loam; Lawson, Ross, and Wirt soils are dominantly silt loam and loam; and Landes soils are dominantly fine sandy loam and loamy fine sand.

Plant and Animal Life

Soils are greatly affected by the type of vegetation under which they formed and by micro-organisms, earthworms, insects, fungi, bacteria, and burrowing animals that live in or on the soil. Also, human activities have affected soil formation.

The chief contribution of vegetation and biological processes to soil formation is the addition of organic material and nitrogen to the soil. The kind and amount of organic material in the soil depends primarily on the kind of native plants that grew on the soil. The remains of the plants accumulated on or below the surface, decayed, and eventually became organic matter or humus. The roots of the plants provided channels for the downward movement of water through the soil and added organic matter as they decayed. Burrowing animals help to incorporate the organic matter into the soil. Bacteria and fungi help to break down the organic matter.

The native vegetation in Coles County consisted primarily of prairie grasses. The dominant species were big bluestem, indiangrass, and switchgrass. Soils that formed under prairie grasses have a thick, dark surface layer. Drummer, Flanagan, and Raub soils are examples. Some areas in the southern part of the county and along the major streams were wooded. Several species of oak, hickory, maple, elm, and ash were dominant in the wooded areas. Natural drainage patterns and the kind of parent material influenced the types of plants that grew in these areas. In cultivated areas the soils that formed under forest vegetation have a surface layer that is thinner and lighter colored than that of the prairie soils. Miami, Russell, and Xenia are examples of soils that formed under forest vegetation. Some soils formed under both types of vegetation and thus have characteristics of both. Toronto and Wingate soils are examples. These soils generally are in areas between forest and prairie soils, but they may also be on slight rises on till plains.

Human activities have affected soil formation in a few small areas of the county. Surface mining for limestone and gravel, borrowing soil material for construction sites, and cutting and filling for roadways have altered some soils. Lenzburg soils are examples.

Relief

Relief, or local variations in elevation, has greatly influenced the soils in Coles County through its effects on runoff, infiltration, erosion, and natural drainage. A comparison of soils that formed in similar kinds of parent material but under different drainage conditions indicates the effect of slope on soil formation. Fincastle and Xenia soils both formed in loess and glacial till. Fincastle soils are nearly level and are somewhat poorly drained. They have a grayish subsoil. Xenia soils are gently sloping and are moderately well drained. They have a brownish subsoil. The color of the subsoil is affected by differences in the degree of oxidation of certain mineral compounds, mainly iron. The nearly level soils, such as Fincastle soils, have a seasonal water table close to the surface. The water in the soil pores restricts the circulation of air, and the iron is poorly oxidized. The poor oxidation results in grayish colors. The water table is lower in the gently sloping Xenia soils, and some of the rainfall runs off the surface. As a result, these soils are drier than the Fincastle soils and more air circulates in the pores. These conditions result in better oxidization of iron and, thus, browner colors in the subsoil.

Local relief directly determines the intensity of erosion. The steeper soils generally are more severely eroded than the less sloping soils, especially if the soils are used for production of row crops. On some soils, such as the severely eroded Miami soils, erosion is so rapid that the surface soil particles are removed as soon as the soil forms.

Climate

Coles County has a temperate, humid, continental climate that is essentially uniform throughout the county. Climatic differences within the county are too small to have caused any obvious differences among the soils. In some areas, however, the effects of climate are modified locally by relief.

Climate affects soil formation through its effects on weathering, plant and animal life, and erosion. Water from rains and melting snow seeps slowly downward through the soil and causes physical and chemical changes in the parent material. Where the water can move downward, it moves clay from the surface layer into the subsoil. The water dissolves minerals and moves them downward through the soil. This leaching process has removed calcium carbonate, or free lime, from the upper layers in most of the soils in the county.

Climate also influences the kind and extent of living organisms, particularly plants. The climate in the survey area has favored the growth of prairie grasses and deciduous hardwoods.

Time

To a great extent, time determines the degree of profile development in a soil. The influence of time, however, is modified by wetness, erosion, the deposition of material, and local relief. Soils that are subject to flooding receive new deposits each time they are flooded. As a result, soils on flood plains are morphologically much younger than the soils in the more stable landscape positions.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedding system. A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on the contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil,

expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and

duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained

away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the

soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range in moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or

management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to Ca^{++} + Mg^{++}. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters).

Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-80 at Charleston and Mattoon, Illinois)

Month	Temperature: Average daily maximum	Temperature: Average daily minimum	Temperature: Average	Temperature: 2 years in 10 will have-- Maximum temperature higher than--	Temperature: 2 years in 10 will have-- Minimum temperature lower than--	Temperature: Average number of growing degree days*	Precipitation: Average	Precipitation: 2 years in 10 will have-- Less than--	Precipitation: 2 years in 10 will have-- More than--	Precipitation: Average number of days with 0.10 inch or more	Precipitation: Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	33.8	17.4	25.6	40	15	2	1.90	0.77	2.85	4	5.5
February	38.8	21.6	30.3	45	18	3	1.96	.99	2.81	4	4.2
March	49.2	30.5	39.9	57	29	35	3.26	1.66	4.67	7	3.6
April	63.6	42.2	52.9	69	41	171	3.75	1.90	5.36	7	.1
May	74.1	52.0	63.0	79	49	418	3.71	2.18	5.08	7	.0
June	83.5	61.1	72.4	87	58	678	4.19	2.22	5.92	6	.0
July	86.5	65.1	75.8	91	63	807	4.27	2.19	6.09	6	.0
August	84.6	63.0	73.8	88	61	746	3.14	1.38	4.65	5	.0
September	78.9	55.5	67.2	83	52	524	3.05	1.09	4.68	5	.0
October	66.7	43.7	55.2	72	42	220	2.32	.96	3.46	4	.0
November	50.9	32.8	41.9	57	31	43	2.73	1.24	4.01	5	1.8
December	39.1	23.5	31.3	45	19	4	2.71	.89	4.20	5	3.5
Yearly:											
Average	62.5	42.4	52.4	---	---	---	---	---	---	---	---
Extreme	---	---	---	---	---	---	---	---	---	---	---
Total	---	---	---	---	---	3,651	36.99	17.47	53.78	65	18.7

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-80 at Charleston and Mattoon, Illinois)

Probability	Temperature: 24 °F or lower	Temperature: 28 °F or lower	Temperature: 32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 9	Apr. 20	May 2
2 years in 10 later than--	Apr. 4	Apr. 15	Apr. 27
5 years in 10 later than--	Mar. 25	Apr. 5	Apr. 18
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 23	Oct. 12	Oct. 5
2 years in 10 earlier than--	Oct. 29	Oct. 18	Oct. 9
5 years in 10 earlier than--	Nov. 8	Oct. 28	Oct. 18

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-80 at Charleston and Mattoon, Illinois)

Probability	Daily minimum temperature during growing season: Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	205	183	163
8 years in 10	212	191	169
5 years in 10	228	206	182
2 years in 10	243	221	194
1 year in 10	250	228	200

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
27C2	Miami loam, 5 to 10 percent slopes, eroded	13,155	4.0
27C3	Miami loam, 5 to 10 percent slopes, severely eroded	835	0.3
27D2	Miami loam, 10 to 15 percent slopes, eroded	2,725	0.8
27D3	Miami loam, 10 to 15 percent slopes, severely eroded	610	0.2
27E	Miami loam, 15 to 30 percent slopes	5,920	1.8
27G	Miami loam, 30 to 60 percent slopes	10,370	3.2
56B	Dana silt loam, 2 to 5 percent slopes	3,725	1.1
56B2	Dana silt loam, 2 to 5 percent slopes, eroded	16,335	5.0
73	Ross loam	1,570	0.5
107	Sawmill silty clay loam	1,750	0.5
132A	Starks silt loam, 0 to 2 percent slopes	2,475	0.8
132B	Starks silt loam, 2 to 5 percent slopes	1,400	0.4
134B	Camden silt loam, 1 to 5 percent slopes	2,105	0.6
136	Brooklyn silt loam	2,870	0.9
148B	Proctor silt loam, 1 to 5 percent slopes	375	0.1
149	Brenton silt loam	645	0.2
152	Drummer silty clay loam	101,065	31.2
153	Pella silty clay loam	1,755	0.5
154	Flanagan silt loam	23,920	7.3
206	Thorp silt loam	1,285	0.4
219	Millbrook silt loam	1,760	0.5
226	Wirt silt loam	925	0.3
284	Tice silty clay loam	455	0.1
291B	Xenia silt loam, 1 to 5 percent slopes	31,460	9.7
304	Landes fine sandy loam	4,355	1.3
322B	Russell silt loam, 1 to 5 percent slopes	1,920	0.6
322C2	Russell silt loam, 5 to 10 percent slopes, eroded	4,390	1.3
330	Peotone silty clay loam	1,035	0.3
348B	Wingate silt loam, 2 to 5 percent slopes	8,950	2.7
353	Toronto silt loam	15,860	4.9
424	Shoals loam	1,290	0.4
451	Lawson silt loam	6,500	2.0
481	Raub silt loam	25,930	8.0
496	Fincastle silt loam	18,100	5.5
533	Urban land	1,080	0.3
570B	Martinsville silt loam, 1 to 5 percent slopes	385	0.1
570C2	Martinsville silt loam, 5 to 12 percent slopes, eroded	940	0.3
864	Pits, quarry	145	*
871B	Lenzburg gravelly loam, 1 to 5 percent slopes	515	0.2
871D	Lenzburg loam, 7 to 20 percent slopes	355	0.1
2152	Drummer-Urban land complex	1,080	0.3
2291B	Xenia-Urban land complex, 1 to 5 percent slopes	505	0.2
2481	Raub-Urban land complex	2,030	0.6
2496	Fincastle-Urban land complex	885	0.3
	Water	705	0.2
	Total	326,445	100.0

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
56B	Dana silt loam, 2 to 5 percent slopes
56B2	Dana silt loam, 2 to 5 percent slopes, eroded
73	Ross loam
107	Sawmill silty clay loam (where drained and either protected from flooding or not frequently flooded during the growing season)
132A	Starks silt loam, 0 to 2 percent slopes (where drained)
132B	Starks silt loam, 2 to 5 percent slopes (where drained)
134B	Camden silt loam, 1 to 5 percent slopes
136	Brooklyn silt loam (where drained)
148B	Proctor silt loam, 1 to 5 percent slopes
149	Brenton silt loam
152	Drummer silty clay loam (where drained)
153	Pella silty clay loam (where drained)
154	Flanagan silt loam
206	Thorp silt loam (where drained)
219	Millbrook silt loam (where drained)
226	Wirt silt loam (where protected from flooding or not frequently flooded during the growing season)
284	Tice silty clay loam (where protected from flooding or not frequently flooded during the growing season)
291B	Xenia silt loam, 1 to 5 percent slopes
304	Landes fine sandy loam (where protected from flooding or not frequently flooded during the growing season)
322B	Russell silt loam, 1 to 5 percent slopes
330	Peotone silty clay loam (where drained)
348B	Wingate silt loam, 2 to 5 percent slopes
353	Toronto silt loam (where drained)
424	Shoals loam (where drained and either protected from flooding or not frequently flooded during the growing season)
451	Lawson silt loam (where protected from flooding or not frequently flooded during the growing season)
481	Raub silt loam
496	Fincastle silt loam (where drained)
570B	Martinsville silt loam, 1 to 5 percent slopes
871B	Lenzburg gravelly loam, 1 to 5 percent slopes

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Orchardgrass-alfalfa hay	Bromegrass-alfalfa
		Bu	Bu	Bu	Tons	AUM*
27C2---------------------- Miami	IIIe	114	38	48	4.5	7.5
27C3---------------------- Miami	IVe	105	35	44	4.2	7.0
27D2---------------------- Miami	IVe	109	36	46	4.3	7.2
27D3---------------------- Miami	VIe	---	---	---	4.0	6.6
27E----------------------- Miami	VIe	---	---	---	3.4	5.6
27G----------------------- Miami	VIIe	---	---	---	---	---
56B----------------------- Dana	IIe	142	45	59	5.4	9.1
56B2---------------------- Dana	IIe	137	43	58	5.3	8.8
73------------------------ Ross	IIw	145	46	60	5.5	9.2
107----------------------- Sawmill	IIIw	132	42	---	---	---
132A---------------------- Starks	IIw	129	40	55	5.1	8.5
132B---------------------- Starks	IIe	128	39	54	5.0	8.4
134B---------------------- Camden	IIe	124	39	54	5.0	8.2
136----------------------- Brooklyn	IIw	108	35	44	---	---
148B---------------------- Proctor	IIe	143	44	58	5.4	9.1
149----------------------- Brenton	I	160	47	62	5.9	9.8
152----------------------- Drummer	IIw	154	51	61	---	---
153----------------------- Pella	IIw	140	48	56	---	---
154----------------------- Flanagan	I	162	52	67	6.1	10.2

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Orchardgrass-alfalfa hay	Bromegrass-alfalfa
		Bu	Bu	Bu	Tons	AUM*
206------ Thorp	IIw	126	42	51	---	---
219------ Millbrook	I	137	44	59	5.1	8.5
226------ Wirt	IIw	95	32	---	4.0	7.3
284------ Tice	IIIw	110	34	---	4.1	7.5
291B------ Xenia	IIe	120	42	48	4.0	7.3
304------ Landes	IIw	99	34	---	3.7	4.7
322B------ Russell	IIe	124	44	55	4.8	7.9
322C2------ Russell	IIIe	115	39	52	4.5	7.7
330------ Peotone	IIw	123	42	43	---	---
348B------ Wingate	IIe	132	42	56	5.0	8.4
353------ Toronto	IIw	141	44	59	5.4	9.1
424------ Shoals	IIw	145	46	---	5.0	8.4
451------ Lawson	IIIw	161	47	---	5.7	9.5
481------ Raub	IIw	155	51	63	6.1	10.2
496------ Fincastle	IIw	131	41	55	5.0	8.4
533**. Urban land						
570B------ Martinsville	IIe	119	37	50	4.8	7.9
570C2------ Martinsville	IIIe	114	35	48	4.5	7.7
864**. Pits						
871B------ Lenzburg	IIe	75	23	26	3.4	5.5

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Orchardgrass-alfalfa hay	Bromegrass-alfalfa
		Bu	Bu	Bu	Tons	AUM*
871D---------------------- Lenzburg	VIe	---	---	---	2.7	3.9
2152**: Drummer.						
Urban land.						
2291B**: Xenia.						
Urban land.						
2481**: Raub.						
Urban land.						
2496**: Fincastle.						
Urban land.						

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.
** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

(Miscellaneous areas are excluded. Absence of an entry indicates no acreage)

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	26,325	---	---	---
II	248,698	71,863	176,835	---
III	27,190	14,130	13,060	---
IV	3,560	3,560	---	---
V	---	---	---	---
VI	6,885	6,885	---	---
VII	10,370	10,370	---	---
VIII	---	---	---	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
27C2, 27C3, 27D2, 27D3 Miami	5A	Slight	Slight	Slight	Slight	White oak	90	72	Eastern white pine, red pine, white ash, yellow poplar, black walnut.
						Yellow poplar	98	104	
						Sweetgum	76	70	
27E Miami	5R	Moderate	Moderate	Slight	Slight	White oak	90	72	Eastern white pine, red pine, white ash, yellow poplar, black walnut.
						Yellow poplar	98	104	
						Sweetgum	76	70	
27G Miami	5R	Severe	Severe	Slight	Slight	White oak	90	72	Eastern white pine, red pine, white ash, yellow poplar, black walnut.
						Yellow poplar	98	104	
						Sweetgum	76	70	
73 Ross	5A	Slight	Slight	Slight	Slight	Northern red oak	86	68	Eastern white pine, black walnut, white ash, Norway spruce, yellow poplar.
						Yellow poplar	96	104	
						Sugar maple	85	52	
						White oak	---	---	
						Black walnut	---	---	
						Black cherry	---	---	
						White ash	---	---	
132A, 132B Starks	4A	Slight	Slight	Slight	Slight	White oak	80	62	Sugar maple, American sycamore, yellow poplar, white oak, green ash.
						Northern red oak	80	62	
						Yellow poplar	90	90	
						Black walnut	---	---	
134B Camden	7A	Slight	Slight	Slight	Slight	Yellow poplar	95	98	White ash, white oak, black walnut, green ash, eastern white pine, red pine, yellow poplar, black locust.
						Green ash	76	75	
						White oak	85	67	
						Northern red oak	85	67	
						Sweetgum	80	79	
219 Millbrook	4A	Slight	Slight	Slight	Slight	White oak	80	62	White oak, black walnut, northern red oak, green ash, sugar maple.
						Northern red oak	80	62	
						Yellow poplar	90	90	
						Black walnut	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
226------------- Wirt	7A	Slight	Slight	Slight	Slight	Yellow poplar-------	95	98	Eastern white pine, black walnut, yellow poplar.
284------------- Tice	5A	Slight	Slight	Slight	Slight	Pin oak------------- Sweetgum------------ Yellow poplar------- Virginia pine------- Eastern cottonwood-- White ash-----------	96 86 90 90 --- ---	78 95 90 135 --- ---	American sycamore, eastern cottonwood, green ash, yellow poplar, red maple, cherrybark oak.
291B------------ Xenia	5A	Slight	Slight	Slight	Slight	White oak----------- Yellow poplar------- Sweetgum------------	90 98 76	72 104 70	Eastern white pine, red pine, black walnut, white ash, yellow poplar.
304------------- Landes	7A	Slight	Slight	Slight	Slight	Yellow poplar------- Eastern cottonwood-- American sycamore--- Sweetgum------------ Green ash-----------	95 105 --- --- ---	98 141 --- --- ---	Eastern cottonwood, yellow poplar, American sycamore, sweetgum, green ash, black walnut, eastern white pine, sugar maple.
322B, 322C2----- Russell	5A	Slight	Slight	Slight	Slight	White oak----------- Northern red oak---- Yellow poplar------- Sweetgum------------	90 90 96 76	72 72 100 70	Eastern white pine, white ash, yellow poplar, black walnut, white oak, northern red oak, green ash, black cherry.
424------------- Shoals	5W	Slight	Moderate	Moderate	Slight	Pin oak------------- Sweetgum------------ Yellow poplar------- Virginia pine------- Eastern cottonwood-- White ash-----------	90 86 90 90 --- ---	72 95 90 135 --- ---	Sweetgum, red maple, swamp chestnut oak, pin oak, yellow poplar.
451------------- Lawson	2W	Slight	Moderate	Slight	Slight	Silver maple-------- White ash----------- Red maple-----------	70 --- ---	25 --- ---	White spruce, silver maple, white ash.

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
496 Fincastle	4A	Slight	Slight	Slight	Slight	Northern red oak	75	57	Eastern white pine, baldcypress, white ash, red maple, yellow poplar, American sycamore.
						White oak	75	57	
						Pin oak	85	67	
						Yellow poplar	85	84	
						Sweetgum	80	79	
570B, 570C2 Martinsville	4A	Slight	Slight	Slight	Slight	White oak	80	62	Eastern white pine, red pine, white ash, yellow poplar, black walnut.
						Yellow poplar	98	104	
						Sweetgum	76	70	
871B, 871D Lenzburg	5A	Slight	Slight	Slight	Slight	Sweetgum	76	70	Black walnut, green ash, white ash, eastern cottonwood.
						Black walnut	73	---	
						Eastern cottonwood	---	---	
2291B**:									
Xenia	5A	Slight	Slight	Slight	Slight	White oak	90	72	Eastern white pine, red pine, black walnut, white ash, yellow poplar.
						Yellow poplar	98	104	
						Sweetgum	76	70	
Urban land.									
2496**:									
Fincastle	4A	Slight	Slight	Slight	Slight	Northern red oak	75	57	Eastern white pine, baldcypress, white ash, red maple, yellow poplar, American sycamore.
						White oak	75	57	
						Pin oak	85	67	
						Yellow poplar	85	84	
						Sweetgum	80	79	
Urban land.									

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

(The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
27C2, 27C3, 27D2, 27D3, 27E, 27G---Miami	American cranberrybush, silky dogwood, chokecherry.	White fir, blue spruce, northern whitecedar, Washington hawthorn, green ash.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
56B, 56B2---------Dana	American cranberrybush, silky dogwood, chokecherry.	White fir, blue spruce, northern whitecedar, Washington hawthorn, green ash.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
73----------------Ross	Silky dogwood, American cranberrybush, nannyberry.	Washington hawthorn, northern whitecedar, blue spruce, white fir, Austrian pine, green ash.	Norway spruce---------	Pin oak, eastern white pine.
107---------------Sawmill	American cranberrybush, silky dogwood, American plum.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn, green ash.	Eastern white pine----	Pin oak.
132A, 132B--------Starks	American cranberrybush, silky dogwood, nannyberry.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn, green ash.	Norway spruce---------	Eastern white pine, pin oak.
134B--------------Camden	American cranberrybush, silky dogwood, chokecherry.	Northern whitecedar, white fir, Washington hawthorn, blue spruce, green ash.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
136---------------Brooklyn	Silky dogwood, American cranberrybush, American plum.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn, green ash.	Eastern white pine----	Pin oak.
148B--------------Proctor	Silky dogwood, American cranberrybush, chokecherry.	White fir, blue spruce, northern whitecedar, Washington hawthorn, green ash.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
149---------------Brenton	Silky dogwood, American cranberrybush, nannyberry.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn, green ash.	Norway spruce---------	Eastern white pine, pin oak.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
152--------------- Drummer	American cranberrybush, silky dogwood, American plum.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn, green ash.	Eastern white pine----	Pin oak.
153--------------- Pella	Chokecherry, nannyberry, silky dogwood, blackhaw.	Red oak, Osageorange, green ash, black locust, Washington hawthorn, northern whitecedar, white spruce, eastern redcedar.	---	---
154--------------- Flanagan	Silky dogwood, American cranberrybush, nannyberry.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn, green ash.	Norway spruce---------	Eastern white pine, pin oak.
206--------------- Thorp	Silky dogwood, American cranberrybush, American plum.	Washington hawthorn, white fir, blue spruce, northern whitecedar, Austrian pine, Norway spruce, green ash.	Eastern white pine----	Pin oak.
219--------------- Millbrook	Silky dogwood, American cranberrybush, nannyberry.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn, green ash.	Norway spruce---------	Eastern white pine, pin oak.
226--------------- Wirt	American cranberrybush, silky dogwood, nannyberry.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn, green ash.	Norway spruce---------	Eastern white pine, pin oak.
284--------------- Tice	Silky dogwood, American cranberrybush, nannyberry.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn, green ash.	Norway spruce---------	Eastern white pine, pin oak.
291B-------------- Xenia	American cranberrybush, silky dogwood, nannyberry.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn, green ash.	Norway spruce---------	Eastern white pine, pin oak.
304--------------- Landes	Silky dogwood, American cranberrybush, Washington hawthorn, chokecherry, eastern redcedar.	Osageorange, red pine, Austrian pine, eastern white pine, northern whitecedar, green ash, black locust.	---	---

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- 8-15	16-25	26-35	>35
322B, 322C2 Russell	American cranberrybush, silky dogwood, chokecherry.	White fir, blue spruce, northern whitecedar, Washington hawthorn, green ash.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
330 Peotone	Silky dogwood, American cranberrybush, American plum.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn, green ash.	Eastern white pine	Pin oak.
348B Wingate	American cranberrybush, silky dogwood, chokecherry.	White fir, blue spruce, northern whitecedar, Washington hawthorn, green ash.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
353 Toronto	American cranberrybush, silky dogwood, nannyberry.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn, green ash.	Norway spruce	Eastern white pine, pin oak.
424 Shoals	Silky dogwood, American cranberrybush, nannyberry.	Northern whitecedar, Austrian pine, white fir, blue spruce, Washington hawthorn, green ash.	Norway spruce	Eastern white pine, pin oak.
451 Lawson	American cranberrybush, silky dogwood, nannyberry.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn, green ash.	Norway spruce	Eastern white pine, pin oak.
481 Raub	American cranberrybush, silky dogwood, nannyberry.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn, green ash.	Norway spruce	Eastern white pine, pin oak.
496 Fincastle	American cranberrybush, silky dogwood, nannyberry.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn, green ash.	Norway spruce	Eastern white pine, pin oak.
533*. Urban land				
570B, 570C2 Martinsville	American cranberrybush, silky dogwood, chokecherry.	White fir, blue spruce, northern whitecedar, Washington hawthorn, green ash.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
864*. Pits				

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- 8-15	16-25	26-35	>35
871B, 871D: Lenzburg	Eastern redcedar, jack pine, Washington hawthorn, Osageorange, smooth arrowwood, red haw.	Honeylocust, eastern white pine, black locust, green ash, hackberry, red oak.	---	---
2152*:				
Drummer.				
Urban land.				
2291B*:				
Xenia	American cranberrybush, silky dogwood, nannyberry.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn, green ash.	Norway spruce	Eastern white pine, pin oak.
Urban land.				
2481*:				
Raub	American cranberrybush, silky dogwood, nannyberry.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn, green ash.	Norway spruce	Eastern white pine, pin oak.
Urban land.				
2496*:				
Fincastle	American cranberrybush, silky dogwood, nannyberry.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn, green ash.	Norway spruce	Eastern white pine, pin oak.
Urban land.				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
27C2, 27C3 Miami	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight	Slight.
27D2, 27D3 Miami	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
27E Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
27G Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
56B, 56B2 Dana	Slight	Slight	Moderate: slope.	Slight	Slight.
73 Ross	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
107 Sawmill	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
132A, 132B Starks	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
134B Camden	Slight	Slight	Moderate: slope.	Slight	Slight.
136 Brooklyn	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
148B Proctor	Slight	Slight	Moderate: slope.	Slight	Slight.
149 Brenton	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
152 Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
153 Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
154 Flanagan	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
206 Thorp	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
219 Millbrook	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
226 Wirt	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
284 Tice	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding.	Severe: flooding.
291B Xenia	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.
304 Landes	Severe: flooding.	Moderate: flooding.	Slight	Moderate: flooding.	Severe: flooding.
322B Russell	Slight	Slight	Moderate: slope.	Slight	Slight.
322C2 Russell	Slight	Slight	Severe: slope.	Slight	Slight.
330 Peotone	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
348B Wingate	Slight	Slight	Moderate: slope.	Slight	Slight.
353 Toronto	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
424 Shoals	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
451 Lawson	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
481 Raub	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
496 Fincastle	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
533*. Urban land					
570B Martinsville	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
570C2 Martinsville	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
864*. Pits					
871B Lenzburg	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight	Moderate: large stones.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
871D: Lenzburg	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.
2152*:					
Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Urban land.					
2291B*:					
Xenia	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Slight.
Urban land.					
2481*:					
Raub	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					
2496*:					
Fincastle	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
27C2, 27C3: Miami	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
27D2, 27D3, 27E: Miami	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
27G: Miami	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
56B, 56B2: Dana	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
73: Ross	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
107: Sawmill	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
132A: Starks	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
132B: Starks	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
134B: Camden	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
136: Brooklyn	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
148B: Proctor	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
149: Brenton	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
152: Drummer	Fair	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
153: Pella	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
154: Flanagan	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
206: Thorp	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
219: Millbrook	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
226: Wirt	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
284: Tice	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
291B Xenia	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
304 Landes	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
322B Russell	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
322C2 Russell	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
330 Peotone	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
348B Wingate	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
353 Toronto	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
424 Shoals	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
451 Lawson	Good	Good	Fair	Good	Good	Fair	Fair	Good	Good	Fair.
481 Raub	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
496 Fincastle	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
533*. Urban land										
570B Martinsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
570C2 Martinsville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
864*. Pits										
871B Lenzburg	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
871D Lenzburg	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
2152*:										
Drummer	Fair	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
Urban land.										
2291B*:										
Xenia	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Urban land.										

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
2481*:										
Raub	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Urban land.										
2496*:										
Fincastle	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Urban land.										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
27C2, 27C3: Miami	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.	Slight.
27D2, 27D3: Miami	Moderate: slope, dense layer.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
27E, 27G: Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
56B, 56B2: Dana	Moderate: dense layer, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
73: Ross	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
107: Sawmill	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
132A, 132B: Starks	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
134B: Camden	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
136: Brooklyn	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
148B: Proctor	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
149: Brenton	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
152: Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
153: Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
154---------------- Flanagan	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
206---------------- Thorp	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
219---------------- Millbrook	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
226---------------- Wirt	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
284---------------- Tice	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding, frost action.	Severe: flooding.
291B--------------- Xenia	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
304---------------- Landes	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
322B--------------- Russell	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
322C2-------------- Russell	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
330---------------- Peotone	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
348B--------------- Wingate	Moderate: dense layer, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
353---------------- Toronto	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
424---------------- Shoals	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.	Severe: wetness, flooding.
451---------------- Lawson	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
481---------------- Raub	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
496: Fincastle	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
533*. Urban land						
570B: Martinsville	Severe: cutbanks cave.	Slight	Slight	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.	Slight.
570C2: Martinsville	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
864*. Pits						
871B: Lenzburg	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: large stones.
871D: Lenzburg	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: large stones, slope.
2152*: Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Urban land.						
2291B*: Xenia	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
Urban land.						
2481*: Raub	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Urban land.						
2496*: Fincastle	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Urban land.						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
27C2, 27C3: Miami	Severe: percs slowly.	Severe: slope.	Slight	Slight	Good.
27D2, 27D3: Miami	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
27E, 27G: Miami	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
56B, 56B2: Dana	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Slight	Fair: too clayey, wetness.
73: Ross	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Good.
107: Sawmill	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
132A, 132B: Starks	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
134B: Camden	Moderate: wetness.	Severe: seepage.	Severe: seepage, wetness.	Moderate: wetness.	Fair: too clayey.
136: Brooklyn	Severe: ponding, percs slowly.	Slight	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
148B: Proctor	Moderate: percs slowly.	Severe: seepage.	Severe: seepage, too sandy.	Slight	Poor: too sandy.
149: Brenton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
152: Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
153: Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
154: Flanagan	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack.
206: Thorp	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: ponding.	Poor: ponding.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
219----------------- Millbrook	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
226----------------- Wirt	Severe: flooding.	Severe: seepage, flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Good.
284----------------- Tice	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack.
291B---------------- Xenia	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
304----------------- Landes	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
322B---------------- Russell	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
322C2--------------- Russell	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
330----------------- Peotone	Severe: ponding, percs slowly.	Slight-----------	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
348B---------------- Wingate	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
353----------------- Toronto	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
424----------------- Shoals	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
451----------------- Lawson	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
481----------------- Raub	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
496----------------- Fincastle	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
533*. Urban land					
570B---------------- Martinsville	Slight-----------	Severe: seepage.	Severe: seepage.	Slight-----------	Fair: thin layer.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
570C2----------------- Martinsville	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: slope, thin layer.
864*. Pits					
871B----------------- Lenzburg	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey, small stones.
871D----------------- Lenzburg	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, small stones, slope.
2152*:					
Drummer------------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Urban land.					
2291B*:					
Xenia--------------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Urban land.					
2481*:					
Raub---------------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
Urban land.					
2496*:					
Fincastle----------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Urban land.					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
27C2, 27C3 Miami	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey.
27D2, 27D3 Miami	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope, too clayey.
27E Miami	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
27G Miami	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
56B, 56B2 Dana	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
73 Ross	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
107 Sawmill	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
132A, 132B Starks	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
134B Camden	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
136 Brooklyn	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
148B Proctor	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
149 Brenton	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
152 Drummer	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
153 Pella	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
154 Flanagan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
206 Thorp	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
219 Millbrook	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
226 Wirt	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
284 Tice	Fair: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
291B Xenia	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
304 Landes	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones, thin layer.
322B, 322C2 Russell	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
330 Peotone	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
348B Wingate	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
353 Toronto	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
424 Shoals	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
451 Lawson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
481 Raub	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
496 Fincastle	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
533*. Urban land				
570B Martinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
570C2 Martinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
864*. Pits				
871B, 871D Lenzburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
2152*:				
Drummer	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Urban land.				
2291B*:				
Xenia	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Urban land.				
2481*:				
Raub	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
2496*:				
Fincastle	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Drainage	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
27C2, 27C3 Miami	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily, rooting depth.
27D2, 27D3, 27E, 27G Miami	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily, rooting depth.
56B, 56B2 Dana	Moderate: seepage, slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
73 Ross	Severe: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Favorable	Favorable.
107 Sawmill	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness	Wetness.
132A Starks	Moderate: seepage.	Severe: thin layer, wetness.	Severe: cutbanks cave.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
132B Starks	Moderate: seepage, slope.	Severe: thin layer, wetness.	Severe: cutbanks cave.	Frost action, slope.	Erodes easily, wetness.	Wetness, erodes easily.
134B Camden	Moderate: seepage, slope.	Severe: thin layer.	Moderate: deep to water, slow refill.	Deep to water	Erodes easily	Erodes easily.
136 Brooklyn	Slight	Severe: thin layer, ponding.	Severe: slow refill.	Ponding, percs slowly, frost action.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
148B Proctor	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily, too sandy.	Erodes easily.
149 Brenton	Moderate: seepage.	Severe: wetness.	Severe: cutbanks cave.	Frost action	Wetness	Wetness.
152 Drummer	Moderate: seepage.	Severe: ponding.	Moderate: slow refill.	Ponding, frost action.	Ponding	Wetness.
153 Pella	Moderate: seepage.	Severe: piping, ponding.	Moderate: slow refill.	Ponding, frost action.	Ponding	Wetness.
154 Flanagan	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Frost action	Erodes easily, wetness.	Erodes easily.
206 Thorp	Severe: seepage.	Severe: ponding.	Severe: slow refill, cutbanks cave.	Ponding, percs slowly, frost action.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
219 Millbrook	Moderate: seepage.	Severe: wetness.	Severe: cutbanks cave.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
226 Wirt	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
284 Tice	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness	Favorable.
291B Xenia	Moderate: seepage, slope.	Moderate: thin layer, wetness.	Severe: slow refill.	Frost action, slope.	Erodes easily, wetness.	Erodes easily.
304 Landes	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Favorable.
322B, 322C2 Russell	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
330 Peotone	Slight	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Wetness.
348B Wingate	Moderate: seepage, slope.	Severe: thin layer.	Severe: slow refill.	Frost action, slope.	Erodes easily, wetness.	Erodes easily.
353 Toronto	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Frost action	Wetness	Wetness.
424 Shoals	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
451 Lawson	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
481 Raub	Slight	Severe: wetness.	Severe: slow refill.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
496 Fincastle	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
533*. Urban land						
570B Martinsville	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
570C2 Martinsville	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
864*. Pits						
871B Lenzburg	Slight	Moderate: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
871D-------------- Lenzburg	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
2152*:						
Drummer----------	Moderate: seepage.	Severe: ponding.	Moderate: slow refill.	Ponding, frost action.	Ponding--------	Wetness.
Urban land.						
2291B*:						
Xenia------------	Moderate: seepage, slope.	Moderate: thin layer, wetness.	Severe: slow refill.	Frost action, slope.	Erodes easily, wetness.	Erodes easily.
Urban land.						
2481*:						
Raub-------------	Slight---------	Severe: wetness.	Severe: slow refill.	Frost action---	Erodes easily, wetness.	Wetness, erodes easily.
Urban land.						
2496*:						
Fincastle--------	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Frost action---	Erodes easily, wetness.	Wetness, erodes easily.
Urban land.						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
27C2------------- Miami	0-9	Loam-------------	CL, CL-ML, ML	A-4	0	100	95-100	80-100	50-90	15-30	3-10
	9-40	Clay loam, silty clay loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	40-60	Loam-------------	CL, CL-ML, SC, SM-SC	A-4, A-6	0-3	85-100	85-100	70-90	45-70	20-40	5-20
27C3------------- Miami	0-3	Loam-------------	CL, CL-ML, ML	A-4	0	100	95-100	80-100	50-90	15-35	3-10
	3-32	Clay loam, silty clay loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	32-60	Loam-------------	CL, CL-ML, SC, SM-SC	A-4, A-6	0-3	85-100	85-100	70-90	45-70	20-40	5-20
27D2------------- Miami	0-9	Loam-------------	CL, CL-ML, ML	A-4	0	100	95-100	80-100	50-90	15-30	3-10
	9-28	Clay loam, silty clay loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	28-60	Loam-------------	CL, CL-ML, SC, SM-SC	A-4, A-6	0-3	85-100	85-100	70-90	45-70	20-40	5-20
27D3------------- Miami	0-3	Loam-------------	CL, CL-ML, ML	A-4	0	100	95-100	80-100	50-90	15-30	3-10
	3-32	Clay loam, silty clay loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	32-60	Loam-------------	CL, CL-ML, SC, SM-SC	A-4, A-6	0-3	85-100	85-100	70-90	45-70	20-40	5-20
27E, 27G--------- Miami	0-10	Loam-------------	CL, CL-ML, ML	A-4	0	100	95-100	80-100	50-90	15-30	3-10
	10-28	Clay loam, silty clay loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	28-60	Loam-------------	CL, CL-ML, SC, SM-SC	A-4, A-6	0-3	85-100	85-100	70-90	45-70	20-40	5-20
56B-------------- Dana	0-13	Silt loam--------	CL	A-6, A-4	0	100	100	95-100	85-95	30-35	8-12
	13-36	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-98	38-50	20-32
	36-56	Clay loam--------	CL	A-6, A-7	0	90-100	90-95	80-90	65-75	37-50	17-30
	56-60	Loam-------------	CL, ML, CL-ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	17-30	2-14
56B2------------- Dana	0-8	Silt loam--------	CL	A-6, A-4	0	100	100	95-100	85-95	30-35	8-12
	8-25	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-98	38-50	20-32
	25-52	Clay loam--------	CL	A-6, A-7	0	90-100	90-95	80-90	65-75	37-50	17-30
	52-60	Loam-------------	CL, ML, CL-ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	17-30	2-14
73--------------- Ross	0-15	Loam-------------	ML, CL-ML, CL	A-4, A-6	0	90-100	90-100	80-100	65-95	20-35	NP-12
	15-60	Loam, silt loam, silty clay loam.	ML, CL, CL-ML	A-6, A-4, A-7	0	90-100	85-100	70-100	55-95	22-45	3-20
107-------------- Sawmill	0-26	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-100	30-50	15-30
	26-54	Silty clay loam, clay loam, loam.	CL	A-6, A-7, A-4	0	100	100	85-100	70-95	25-50	8-25
	54-60	Silty clay loam, clay loam, silt loam.	CL	A-4, A-6, A-7	0	100	100	75-100	65-95	20-50	8-30

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
132A, 132B------- Starks	0-13	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	20-35	4-15
	13-36	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-100	35-45	15-25
	36-60	Loam, clay loam, sandy loam.	CL, SC, CL-ML, SM-SC	A-4, A-6	0	95-100	90-100	80-95	40-80	25-40	6-17
134B------------- Camden	0-10	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	100	100	95-100	90-100	20-35	3-15
	10-31	Silt loam, silty clay loam.	CL	A-6	0	100	100	95-100	90-100	25-40	15-25
	31-60	Clay loam, sandy clay loam.	ML, SM, CL, SC	A-2, A-4, A-6	0-5	90-100	85-100	60-90	30-70	20-40	3-15
136-------------- Brooklyn	0-9	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-35	5-15
	9-17	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	25-35	5-15
	17-45	Silty clay, silty clay loam.	CH, CL	A-7	0	100	100	95-100	95-100	45-60	25-40
	45-60	Stratified loamy sand to silty clay loam.	CL, CL-ML, SM-SC, SC	A-4, A-2, A-6	0-5	75-100	75-90	60-90	30-70	15-38	5-20
148B------------- Proctor	0-16	Silt loam--------	CL	A-6	0	100	100	95-100	85-100	25-40	10-20
	16-35	Silty clay loam	CL	A-7, A-6	0	95-100	90-100	85-100	85-100	25-50	10-25
	35-60	Clay loam, sandy clay loam, loam.	CL, SC, CL-ML, SM-SC	A-6, A-7, A-4, A-2	0	90-100	85-100	75-100	30-80	20-45	5-25
149-------------- Brenton	0-14	Silt loam--------	CL, ML	A-6, A-4	0	100	95-100	95-100	85-100	30-40	8-15
	14-31	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	95-100	95-100	85-100	35-50	10-25
	31-53	Clay loam, loam, sandy clay loam.	CL	A-6, A-7	0	100	95-100	90-100	75-95	30-45	10-20
	53-60	Stratified loamy sand to silty clay loam.	CL-ML, CL, SM-SC, SC	A-2, A-4, A-6	0	95-100	85-100	80-100	30-85	20-35	5-20
152-------------- Drummer	0-18	Silty clay loam	CL	A-6, A-7	0	100	95-100	95-100	85-95	30-50	15-30
	18-42	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	95-100	85-95	30-50	15-30
	42-55	Loam, silt loam, clay loam.	CL	A-6, A-7	0-5	95-100	90-100	75-95	60-85	30-50	15-30
	55-60	Stratified loamy sand to clay loam.	SC, CL	A-4, A-6	0-5	95-100	85-95	75-95	45-80	20-35	7-20
153-------------- Pella	0-14	Silty clay loam	CL	A-7	0	100	95-100	90-100	85-95	40-50	15-25
	14-31	Silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	90-100	85-95	30-50	15-30
	31-40	Silt loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	90-100	85-95	60-90	25-45	10-25
	40-60	Stratified sandy loam to silty clay loam.	SM-SC, SC, CL, CL-ML	A-2, A-4, A-6	0-5	90-100	80-100	50-100	30-85	20-35	7-20
154-------------- Flanagan	0-19	Silt loam--------	CL	A-7, A-6	0	100	100	95-100	85-100	35-50	15-30
	19-42	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	42-60	Loam, clay loam, silt loam.	CL, CL-ML	A-4, A-6, A-7	0	85-100	80-100	70-95	50-85	20-45	5-30

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
206-------------- Thorp	0-13	Silt loam--------	CL	A-6, A-4	0	95-100	95-100	90-100	75-95	20-40	8-19
	13-19	Silt loam--------	CL	A-4, A-6	0	95-100	95-100	90-100	75-95	25-35	7-15
	19-40	Silty clay loam	CL	A-7, A-6	0	95-100	95-100	90-100	75-95	35-50	13-27
	40-60	Silt loam, clay loam, loam.	CL	A-6, A-4, A-7	0	90-100	90-100	90-100	70-90	20-50	8-26
219-------------- Millbrook	0-14	Silt loam--------	CL, CL-ML, ML	A-6, A-4	0	100	100	95-100	85-100	20-35	3-15
	14-32	Silty clay loam, silt loam.	CL	A-6, A-7-6	0	100	100	95-100	85-100	30-45	10-25
	32-52	Clay loam, loam, sandy loam.	SC, CL	A-6, A-7	0-5	95-100	90-100	70-90	40-80	25-50	10-25
	52-60	Stratified sandy loam to clay loam.	SM, SC, CL-ML, CL	A-4, A-6, A-2	0-5	95-100	90-100	70-95	30-80	<30	NP-15
226-------------- Wirt	0-9	Silt loam--------	CL-ML, ML	A-4	0	95-100	80-100	80-100	65-90	<25	3-7
	9-32	Silt loam, loam	CL-ML, CL, ML	A-4	0	95-100	80-100	75-100	55-90	<25	3-8
	32-60	Stratified sandy loam to silt loam.	SM, SM-SC, ML, CL-ML	A-4, A-2, A-1-b	0-5	85-95	50-85	40-75	20-55	<25	NP-7
284-------------- Tice	0-13	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	30-45	10-20
	13-60	Silty clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-55	15-30
291B------------- Xenia	0-15	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-35	5-15
	15-36	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	35-45	15-25
	36-47	Clay loam, loam, silty clay loam.	CL	A-6, A-7	0-5	90-100	85-95	70-95	50-80	30-45	10-25
	47-60	Loam-------------	CL, CL-ML	A-4, A-6	0-5	90-95	85-95	65-95	50-75	20-30	5-15
304-------------- Landes	0-18	Fine sandy loam	SM, SC, SM-SC	A-4, A-2-4	0	100	70-100	70-95	20-50	<25	NP-10
	18-30	Loam, very fine sandy loam, loamy fine sand.	SM, CL-ML, SC, SM-SC	A-4, A-2-4	0	100	85-100	70-100	15-60	<25	NP-10
	30-60	Loamy fine sand, fine sandy loam.	SM, SP-SM, SC, SM-SC	A-4, A-2-4	0	100	85-100	70-100	10-50	<30	NP-10
322B------------- Russell	0-12	Silt loam--------	CL-ML, CL, ML	A-4	0	100	100	90-100	70-90	<25	3-8
	12-31	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	30-40	10-20
	31-60	Clay loam, loam, sandy clay loam.	CL	A-6	0	95-100	90-95	80-95	60-80	30-35	10-15
322C2------------ Russell	0-6	Silt loam--------	CL-ML, CL, ML	A-4	0	100	100	90-100	70-90	<25	3-8
	6-35	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	30-40	10-20
	35-60	Clay loam, loam, sandy clay loam.	CL	A-6	0	95-100	90-95	80-95	60-80	30-35	10-15
330-------------- Peotone	0-15	Silty clay loam	CH, CL	A-7	0	100	95-100	95-100	80-100	40-65	15-35
	15-35	Silty clay loam, silty clay.	CH, CL	A-7	0-5	100	95-100	90-100	85-100	40-70	15-40
	35-60	Silty clay loam, silt loam, silty clay.	CL, CH, ML, MH	A-7, A-6	0-5	95-100	95-100	90-100	75-98	30-60	15-30

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
348B------------- Wingate	0-11	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-30	4-11
	11-31	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	10-25
	31-46	Clay loam, loam, sandy loam.	CL, SC, CL-ML, SM-SC	A-6, A-4, A-2	0	90-100	80-95	50-90	25-75	25-40	5-20
	46-60	Loam-------------	CL, CL-ML, SC, SM-SC	A-4, A-6	0-3	85-95	85-95	70-95	40-75	20-35	5-15
353-------------- Toronto	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	8-37	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	35-50	20-30
	37-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	15-30	5-15
424-------------- Shoals	0-9	Loam-------------	CL, CL-ML	A-4, A-6	0	100	100	90-100	65-90	20-35	6-15
	9-60	Silt loam, loam, clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-85	25-40	5-15
451-------------- Lawson	0-11	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	85-100	20-40	5-20
	11-26	Silt loam, silty clay loam.	CL, CL-ML	A-4	0	100	100	90-100	85-100	20-30	5-10
	26-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	60-100	20-45	10-25
481-------------- Raub	0-12	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-95	25-35	5-15
	12-25	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	80-95	35-55	20-35
	25-47	Clay loam, silty clay loam, silt loam.	CL	A-6, A-7	0	95-100	90-100	85-95	60-85	35-50	15-25
	47-60	Loam, clay loam, silt loam.	CL, ML, SC, SM	A-4, A-6	0-5	85-95	80-90	70-85	40-65	15-30	NP-15
496-------------- Fincastle	0-11	Silt loam--------	CL, ML, CL-ML	A-4	0	100	95-100	90-100	75-93	<25	3-10
	11-32	Silty clay loam, silt loam.	CL	A-6	0	100	100	95-100	85-95	30-40	10-15
	32-50	Clay loam, loam	CL	A-6	0	95-100	90-98	85-95	75-85	30-40	10-15
	50-60	Loam, clay loam	CL	A-4, A-6	0-3	88-96	82-90	70-86	50-66	25-30	8-11
533*. Urban land											
570B, 570C2------ Martinsville	0-8	Silt loam--------	CL, CL-ML, ML	A-4	0	100	85-100	75-100	65-90	<25	3-8
	8-18	Clay loam, silty clay loam, sandy clay loam.	CL, SC	A-4, A-6, A-2	0	95-100	85-100	70-100	30-95	25-40	7-15
	18-43	Sandy loam, loam, coarse sandy loam.	SM-SC, CL-ML, CL, SC	A-2, A-4, A-6	0	95-100	85-100	55-95	30-75	20-30	5-11
	43-60	Stratified sandy loam to sandy clay loam.	SM, SM-SC, CL-ML	A-4, A-2-4, A-1	0	95-100	85-100	45-95	10-75	<25	NP-8
864*. Pits											

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
871B------------- Lenzburg	0-7	Gravelly loam----	CL, ML	A-4, A-6, A-7	3-15	80-95	75-90	65-90	55-85	25-45	8-25
	7-60	Gravelly silty clay loam, silt loam, gravelly loam.	CL	A-6, A-7	5-15	75-95	70-90	65-85	60-85	25-45	10-25
871D------------- Lenzburg	0-8	Loam-------------	CL, ML	A-6, A-4	2-10	80-100	75-100	65-95	55-85	25-40	8-20
	8-60	Loam, clay loam, gravelly loam.	CL	A-6, A-7	5-15	75-95	70-90	65-85	60-85	25-45	10-25
2152*: Drummer---------	0-17	Silty clay loam	CL	A-6, A-7	0	100	95-100	95-100	85-95	30-50	15-30
	17-42	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	95-100	85-95	30-50	15-30
	42-50	Loam, silt loam, clay loam.	CL	A-6, A-7	0-5	95-100	90-100	75-95	60-85	30-50	15-30
	50-60	Stratified sandy loam to silty clay loam.	SC, CL	A-4, A-6	0-5	95-100	85-95	75-95	45-80	20-35	7-20
Urban land.											
2291B*: Xenia-----------	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-35	5-15
	10-27	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	35-45	15-25
	27-43	Clay loam, loam	CL	A-6, A-7	0-5	90-100	85-95	70-95	50-80	30-45	10-25
	43-60	Loam-------------	CL, CL-ML	A-4, A-6	0-5	90-95	85-95	65-95	50-75	20-30	5-15
Urban land.											
2481*: Raub------------	0-15	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-95	25-35	5-15
	15-33	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	80-95	35-55	20-35
	33-53	Clay loam, silty clay loam.	CL	A-6, A-7	0	95-100	90-100	85-95	60-85	35-50	15-25
	53-60	Loam, clay loam	CL, ML, SC, SM	A-4, A-6	0-5	85-95	80-90	70-85	40-65	15-30	NP-15
Urban land.											
2496*: Fincastle-------	0-9	Silt loam--------	CL, ML, CL-ML	A-4	0	100	95-100	90-100	75-93	<25	3-10
	9-23	Silty clay loam, silt loam.	CL	A-6	0	100	100	95-100	85-95	30-40	10-15
	23-27	Clay loam, loam, silty clay loam.	CL	A-6	0	95-100	90-98	85-95	75-85	30-40	10-15
	27-60	Loam-------------	CL	A-4, A-6	0-3	88-96	82-90	70-86	50-66	25-30	8-11
Urban land.											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
27C2-------------- Miami	0-9	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.37	4	5	.5-2
	9-40	27-35	1.45-1.65	0.6-2.0	0.15-0.20	5.1-7.3	Moderate-----	0.37			
	40-60	15-25	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Moderate-----	0.37			
27C3-------------- Miami	0-3	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.37	3	5	.5-1
	3-32	27-35	1.45-1.65	0.6-2.0	0.15-0.20	5.1-7.3	Moderate-----	0.37			
	32-60	15-25	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Moderate-----	0.37			
27D2-------------- Miami	0-9	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.37	4	5	.5-2
	9-28	27-35	1.45-1.65	0.6-2.0	0.15-0.20	5.1-7.3	Moderate-----	0.37			
	28-60	15-25	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Moderate-----	0.37			
27D3-------------- Miami	0-3	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.37	3	5	.5-1
	3-32	27-35	1.45-1.65	0.6-2.0	0.15-0.20	5.1-7.3	Moderate-----	0.37			
	32-60	15-25	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Moderate-----	0.37			
27E, 27G--------- Miami	0-10	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.37	4	5	.5-3
	10-28	27-35	1.45-1.65	0.6-2.0	0.15-0.20	5.1-7.3	Moderate-----	0.37			
	28-60	15-25	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Moderate-----	0.37			
56B--------------- Dana	0-13	11-22	1.40-1.55	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.32	5	5	3-5
	13-36	27-35	1.45-1.65	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.43			
	36-56	27-35	1.45-1.65	0.6-2.0	0.15-0.19	6.1-7.3	Moderate-----	0.43			
	56-60	15-22	1.70-1.90	0.2-0.6	0.05-0.10	6.6-8.4	Low-----------	0.43			
56B2-------------- Dana	0-8	11-22	1.40-1.55	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.32	5	5	2-4
	8-25	27-35	1.45-1.65	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.43			
	25-52	27-35	1.45-1.65	0.6-2.0	0.15-0.19	6.1-7.3	Moderate-----	0.43			
	52-60	15-22	1.70-1.90	0.2-0.6	0.05-0.10	6.6-8.4	Low-----------	0.43			
73---------------- Ross	0-15	15-27	1.20-1.45	0.6-2.0	0.19-0.24	6.1-7.8	Low-----------	0.32	5	5	3-5
	15-60	18-32	1.20-1.50	0.6-2.0	0.16-0.22	6.1-8.4	Low-----------	0.32			
107--------------- Sawmill	0-26	27-35	1.20-1.40	0.6-2.0	0.21-0.23	6.1-7.8	Moderate-----	0.28	5	7	4-5
	26-54	25-35	1.30-1.45	0.6-2.0	0.17-0.20	6.1-7.8	Moderate-----	0.28			
	54-60	18-35	1.35-1.50	0.6-2.0	0.15-0.19	6.1-8.4	Moderate-----	0.28			
132A, 132B-------- Starks	0-13	18-27	1.15-1.35	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.37	5	6	1-3
	13-36	27-35	1.35-1.55	0.6-2.0	0.18-0.20	5.1-6.5	Moderate-----	0.37			
	36-60	18-30	1.45-1.65	0.6-2.0	0.16-0.19	5.1-7.8	Moderate-----	0.37			
134B-------------- Camden	0-10	14-27	1.15-1.35	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.37	5	6	1-2
	10-31	22-35	1.35-1.55	0.6-2.0	0.16-0.20	5.1-7.3	Moderate-----	0.37			
	31-60	18-30	1.45-1.65	0.6-2.0	0.15-0.25	5.6-7.3	Low-----------	0.37			
136--------------- Brooklyn	0-9	20-27	1.20-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	3	6	3-4
	9-17	14-22	1.25-1.40	0.6-2.0	0.20-0.22	4.5-6.5	Low-----------	0.37			
	17-45	35-45	1.35-1.55	0.06-0.2	0.11-0.20	4.5-7.8	High----------	0.37			
	45-60	10-30	1.40-1.70	0.2-0.6	0.11-0.19	5.1-7.8	Low-----------	0.37			
148B-------------- Proctor	0-16	18-27	1.10-1.30	0.6-2.0	0.22-0.24	5.1-7.8	Low-----------	0.32	5	6	3-4
	16-35	25-35	1.20-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.43			
	35-60	22-35	1.30-1.55	0.6-6.0	0.13-0.16	5.6-7.3	Moderate-----	0.43			
149--------------- Brenton	0-14	20-27	1.25-1.50	0.6-2.0	0.22-0.24	5.6-7.8	Low-----------	0.28	5	6	4-5
	14-31	25-35	1.30-1.55	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.28			
	31-53	20-30	1.40-1.60	0.6-2.0	0.15-0.19	5.6-7.8	Moderate-----	0.28			
	53-60	15-30	1.50-1.70	0.6-2.0	0.11-0.20	5.6-8.4	Low-----------	0.28			

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
152------------- Drummer	0-18	27-35	1.10-1.30	0.6-2.0	0.21-0.23	5.6-7.8	Moderate-----	0.28	5	7	5-7
	18-42	20-35	1.20-1.45	0.6-2.0	0.21-0.24	5.6-7.8	Moderate-----	0.28			
	42-55	22-33	1.30-1.55	0.6-2.0	0.17-0.20	6.1-8.4	Moderate-----	0.28			
	55-60	15-32	1.40-1.70	0.6-2.0	0.11-0.19	6.6-8.4	Low----------	0.28			
153------------- Pella	0-14	27-35	1.10-1.30	0.6-2.0	0.21-0.23	6.1-7.8	Moderate-----	0.28	5	7	5-6
	14-31	27-35	1.20-1.45	0.6-2.0	0.21-0.24	6.6-7.8	Moderate-----	0.28			
	31-40	15-30	1.35-1.60	0.6-2.0	0.15-0.20	7.4-8.4	Moderate-----	0.28			
	40-60	15-30	1.40-1.70	0.6-2.0	0.10-0.22	7.4-8.4	Low----------	0.28			
154------------- Flanagan	0-19	20-27	1.20-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Moderate-----	0.28	5	6	4-5
	19-42	35-42	1.25-1.45	0.6-2.0	0.15-0.22	5.6-7.3	High---------	0.43			
	42-60	20-30	1.45-1.70	0.2-0.6	0.15-0.22	6.1-8.4	Low----------	0.43			
206------------- Thorp	0-13	20-27	1.15-1.35	0.2-0.6	0.22-0.24	5.1-7.8	Low----------	0.37	5	6	4-6
	13-19	18-25	1.30-1.50	0.2-0.6	0.20-0.22	5.1-7.3	Low----------	0.37			
	19-40	27-35	1.35-1.55	0.06-0.2	0.18-0.20	5.1-7.3	Moderate-----	0.37			
	40-60	20-30	1.40-1.60	0.06-0.2	0.15-0.22	5.6-7.8	Moderate-----	0.37			
219------------- Millbrook	0-14	18-27	1.40-1.60	0.6-2.0	0.22-0.24	5.1-7.8	Low----------	0.32	5	6	2-4
	14-32	25-35	1.45-1.65	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.43			
	32-52	18-35	1.45-1.70	0.6-2.0	0.12-0.19	5.1-7.3	Moderate-----	0.32			
	52-60	10-25	1.50-1.75	0.6-2.0	0.11-0.19	5.6-8.4	Low----------	0.32			
226------------- Wirt	0-9	10-18	1.30-1.45	0.6-2.0	0.17-0.20	5.6-7.3	Low----------	0.37	5	5	.5-3
	9-32	10-18	1.40-1.55	0.6-2.0	0.15-0.20	5.6-7.8	Low----------	0.24			
	32-60	8-18	1.45-1.60	2.0-6.0	0.07-0.17	5.6-7.8	Low----------	0.24			
284------------- Tice	0-13	27-35	1.25-1.45	0.6-2.0	0.21-0.24	6.1-7.8	Moderate-----	0.32	5	7	2-3
	13-60	22-35	1.30-1.50	0.6-2.0	0.18-0.20	5.6-7.8	Moderate-----	0.32			
291B------------ Xenia	0-15	11-22	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	5	1-3
	15-36	27-35	1.45-1.65	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.37			
	36-47	24-35	1.45-1.65	0.2-0.6	0.15-0.19	5.6-7.3	Moderate-----	0.37			
	47-60	12-20	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low----------	0.37			
304------------- Landes	0-18	7-20	1.40-1.60	2.0-6.0	0.13-0.20	6.1-8.4	Low----------	0.20	4	3	1-2
	18-30	5-18	1.60-1.70	2.0-6.0	0.10-0.15	6.1-8.4	Low----------	0.32			
	30-60	5-18	1.60-1.80	6.0-20	0.05-0.15	6.1-8.4	Low----------	0.20			
322B------------ Russell	0-12	10-20	1.30-1.45	0.6-2.0	0.22-0.24	6.1-6.5	Low----------	0.37	5	5	.5-2
	12-31	27-35	1.35-1.50	0.6-2.0	0.18-0.20	5.6-6.5	Moderate-----	0.37			
	31-60	20-32	1.40-1.60	0.6-2.0	0.15-0.19	5.6-7.3	Moderate-----	0.37			
322C2----------- Russell	0-6	10-20	1.30-1.45	0.6-2.0	0.22-0.24	6.1-6.5	Low----------	0.37	5	5	.5-2
	6-35	27-35	1.35-1.50	0.6-2.0	0.18-0.20	5.6-6.5	Moderate-----	0.37			
	35-60	20-32	1.40-1.60	0.6-2.0	0.15-0.19	5.6-7.3	Moderate-----	0.37			
330------------- Peotone	0-15	33-40	1.20-1.40	0.2-0.6	0.21-0.23	5.6-7.8	High---------	0.28	5	4	5-7
	15-35	35-45	1.30-1.60	0.2-0.6	0.11-0.20	6.1-7.8	High---------	0.28			
	35-60	25-42	1.40-1.65	0.2-0.6	0.18-0.20	6.6-8.4	High---------	0.28			
348B------------ Wingate	0-11	10-20	1.30-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.32	5	5	2-4
	11-31	25-33	1.40-1.55	0.6-2.0	0.18-0.22	4.5-6.5	Moderate-----	0.43			
	31-46	15-30	1.40-1.60	0.6-2.0	0.12-0.19	4.5-7.3	Moderate-----	0.43			
	46-60	15-24	1.60-1.80	0.2-0.6	0.17-0.19	4.5-7.3	Low----------	0.43			
353------------- Toronto	0-8	18-27	1.30-1.45	0.6-2.0	0.22-0.24	5.1-6.5	Low----------	0.32	5	5	3-4
	8-37	27-35	1.35-1.50	0.6-2.0	0.18-0.20	4.5-7.3	Moderate-----	0.32			
	37-60	18-27	1.50-1.70	0.2-0.6	0.05-0.19	6.6-8.4	Low----------	0.32			
424------------- Shoals	0-9	18-27	1.30-1.50	0.6-2.0	0.22-0.24	6.1-7.8	Low----------	0.37	5	6	2-5
	9-60	18-33	1.35-1.55	0.6-2.0	0.17-0.22	6.1-7.8	Low----------	0.37			

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
451-------------- Lawson	0-11	10-27	1.20-1.55	0.6-2.0	0.22-0.24	6.1-7.8	Low-----------	0.28	5	5	3-5
	11-26	10-30	1.20-1.55	0.6-2.0	0.18-0.22	6.1-7.8	Low-----------	0.28			
	26-60	18-30	1.55-1.65	0.6-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.43			
481-------------- Raub	0-12	20-27	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.28	5	6	2-4
	12-25	27-35	1.50-1.70	0.2-0.6	0.18-0.20	5.1-6.5	Moderate-----	0.37			
	25-47	22-35	1.50-1.70	0.2-0.6	0.15-0.19	6.1-7.3	Moderate-----	0.37			
	47-60	20-32	1.50-1.70	0.2-0.6	0.05-0.19	7.4-8.4	Low-----------	0.37			
496-------------- Fincastle	0-11	11-22	1.40-1.55	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.37	5	5	1-3
	11-32	23-35	1.45-1.65	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-----	0.37			
	32-50	24-32	1.45-1.65	0.6-2.0	0.15-0.19	5.1-7.8	Moderate-----	0.37			
	50-60	20-30	1.55-1.90	0.2-0.6	0.05-0.19	7.4-8.4	Low-----------	0.37			
533*. Urban land											
570B, 570C2------ Martinsville	0-8	8-20	1.30-1.45	0.6-2.0	0.20-0.24	5.1-7.3	Low-----------	0.37	5	5	1-2
	8-18	20-33	1.40-1.60	0.6-2.0	0.16-0.20	5.1-6.5	Moderate-----	0.37			
	18-43	15-25	1.40-1.60	0.6-2.0	0.12-0.17	5.1-6.5	Low-----------	0.24			
	43-60	2-20	1.50-1.70	0.6-6.0	0.08-0.17	5.1-8.4	Low-----------	0.24			
864*. Pits											
871B------------- Lenzburg	0-7	20-35	1.30-1.60	0.6-2.0	0.15-0.19	6.6-8.4	Moderate-----	0.28	5	8	.5-1
	7-60	20-35	1.40-1.70	0.2-0.6	0.11-0.17	7.4-8.4	Moderate-----	0.37			
871D------------- Lenzburg	0-8	20-27	1.30-1.60	0.2-2.0	0.17-0.20	6.6-8.4	Moderate-----	0.37	5	4L	.5-1
	8-60	20-35	1.40-1.70	0.2-0.6	0.11-0.17	7.4-8.4	Moderate-----	0.37			
2152*: Drummer---------	0-17	27-35	1.10-1.30	0.6-2.0	0.21-0.23	5.6-7.8	Moderate-----	0.28	5	7	5-7
	17-42	20-35	1.20-1.45	0.6-2.0	0.21-0.24	5.6-7.8	Moderate-----	0.28			
	42-50	22-33	1.30-1.55	0.6-2.0	0.17-0.20	6.1-8.4	Moderate-----	0.28			
	50-60	15-32	1.40-1.70	0.6-2.0	0.11-0.19	6.6-8.4	Low-----------	0.28			
Urban land.											
2291B*: Xenia-----------	0-10	11-22	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	5	5	1-3
	10-27	27-35	1.45-1.65	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.37			
	27-43	24-35	1.45-1.65	0.2-0.6	0.15-0.19	5.6-7.3	Moderate-----	0.37			
	43-60	12-20	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low-----------	0.37			
Urban land.											
2481*: Raub------------	0-15	20-27	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.28	5	6	2-4
	15-33	27-35	1.50-1.70	0.2-0.6	0.18-0.20	5.1-6.5	Moderate-----	0.37			
	33-53	27-35	1.50-1.70	0.2-0.6	0.15-0.19	6.1-7.3	Moderate-----	0.37			
	53-60	20-32	1.50-1.70	0.2-0.6	0.05-0.19	7.4-8.4	Low-----------	0.37			
Urban land.											

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
2496*:											
Fincastle-------	0-9	11-22	1.40-1.55	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	5	1-3
	9-23	23-35	1.45-1.65	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-----	0.37			
	23-27	24-32	1.45-1.65	0.6-2.0	0.15-0.19	5.1-7.8	Moderate-----	0.37			
	27-60	20-26	1.55-1.90	0.2-0.6	0.05-0.19	7.4-8.4	Low----------	0.37			
Urban land.											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "frequent," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft					
27C2, 27C3, 27D2, 27D3, 27E, 27G--- Miami	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
56B, 56B2--------- Dana	B	None--------	---	---	3.0-6.0	Perched	Mar-Apr	High-----	Moderate	Moderate.
73--------------- Ross	B	Occasional	Very brief	Nov-Jun	>6.0	---	---	Moderate	Low------	Low.
107-------------- Sawmill	B/D	Frequent----	Brief-----	Nov-Jun	0-2.0	Apparent	Mar-Jun	High-----	High-----	Low.
132A, 132B-------- Starks	C	None--------	---	---	1.0-3.0	Apparent	Mar-Jun	High-----	High-----	Moderate.
134B-------------- Camden	B	None--------	---	---	4.0-6.0	Apparent	Mar-Jun	High-----	Low------	Moderate.
136-------------- Brooklyn	C/D	None--------	---	---	+.5-2.0	Apparent	Mar-Jun	High-----	High-----	Moderate.
148B-------------- Proctor	B	None--------	---	---	>6.0	---	---	High-----	Moderate	Moderate.
149-------------- Brenton	B	None--------	---	---	1.0-3.0	Apparent	Mar-Jun	High-----	High-----	Moderate.
152-------------- Drummer	B/D	None--------	---	---	+.5-2.0	Apparent	Mar-Jun	High-----	High-----	Moderate.
153-------------- Pella	B/D	None--------	---	---	+.5-2.0	Apparent	Dec-Jun	High-----	High-----	Low.
154-------------- Flanagan	B	None--------	---	---	1.5-3.5	Apparent	Mar-Jun	High-----	High-----	Moderate.
206-------------- Thorp	C/D	None--------	---	---	+.5-2.0	Apparent	Feb-Jun	High-----	High-----	Moderate.
219-------------- Millbrook	B	None--------	---	---	1.0-3.0	Apparent	Mar-Jun	High-----	High-----	Moderate.
226-------------- Wirt	B	Frequent----	Brief-----	Nov-Jun	>6.0	---	---	Moderate	Low------	Moderate.
284-------------- Tice	B	Frequent----	Brief-----	Nov-Jun	1.0-3.0	Apparent	Mar-Jun	High-----	High-----	Low.
291B-------------- Xenia	B	None--------	---	---	2.0-3.5	Apparent	Dec-Apr	High-----	High-----	Moderate.
304-------------- Landes	B	Frequent----	Brief-----	Nov-Jun	>6.0	---	---	Moderate	Low------	Low.
322B, 322C2------- Russell	B	None--------	---	---	>6.0	---	---	High-----	Moderate	Moderate.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft					
330---------------Peotone	B/D	None--------	---	---	+.5-1.0	Apparent	Feb-Jul	High-----	High-----	Moderate.
348B--------------Wingate	B	None--------	---	---	2.5-5.0	Apparent	Dec-May	High-----	High-----	Moderate.
353---------------Toronto	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	High-----	High-----	High.
424---------------Shoals	C	Frequent----	Brief-----	Nov-Jun	0.5-1.5	Apparent	Jan-Apr	High-----	High-----	Low.
451---------------Lawson	C	Frequent----	Brief-----	Nov-Jun	1.0-3.0	Apparent	Nov-May	High-----	Moderate	Low.
481---------------Raub	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	High-----	High-----	Moderate.
496---------------Fincastle	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	High-----	High-----	Moderate.
533*. Urban land										
570B, 570C2-------Martinsville	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
864*. Pits										
871B, 871D--------Lenzburg	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Low.
2152*:										
Drummer----------	B/D	None--------	---	---	+.5-2.0	Apparent	Mar-Jun	High-----	High-----	Moderate.
Urban land.										
2291B*:										
Xenia------------	B	None--------	---	---	2.0-3.5	Apparent	Dec-Apr	High-----	High-----	Moderate.
Urban land.										
2481*:										
Raub-------------	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	High-----	High-----	Moderate.
Urban land.										
2496*:										
Fincastle--------	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	High-----	High-----	Moderate.
Urban land.										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--ENGINEERING INDEX TEST DATA

(HO means horizon; MAX, maximum dry density; OPT, optimum moisture; LL, liquid limit; PI, plasticity index; AA, AASHTO; and UN, Unified)

Soil name and location	Sample number	HO	Depth	Moisture density MAX	Moisture density OPT	Percentage passing sieve-- No. 4	No. 10	No. 40	No. 200	LL	PI	Classification AA	Classification UN
			In	Lb/ cu ft	Pct					Pct			
Landes fine sandy loam:	81IL-029-14												
2,400 feet east and	-1	Ap	0-8	122	11	100	98	95	45	18	4	A-4(0)	SM-SC
800 feet north of the	-4	Bw1	18-24	122	11	100	100	97	29	18	NP	A-2-4(0)	SM
southwest corner of	-6	C	30-60	117	11	100	100	100	20	18	NP	A-2-4(0)	SM
sec. 21, T. 12 N.,													
R. 9 E.													
Lawson silt loam:	82IL-029-19												
180 feet east and 740	-1	Ap	0-11	107	18	100	99	99	96	36	14	A-6(14)	CL
feet south of the	-3	C1	26-41	102	19	100	100	100	97	44	21	A-7-6(23)	CL
northwest corner of													
sec. 1, T. 11 N.,													
R. 9 E.													
Miami loam:	82IL-029-40												
400 feet west and 2,400	-1	Ap	0-3	105	16	95	93	83	45	36	9	A-4(2)	CL
feet north of the	-4	Bt2	20-25	112	17	98	98	92	70	35	19	A-6(11)	CL
southeast corner of	-7	C	43-47	123	12	97	93	83	60	26	11	A-6(3)	CL
sec. 14, T. 11 N.,													
R. 9 E.													
Millbrook silt loam:	82IL-029-41												
80 feet south and 1,960	-1	Ap	0-8	108	16	100	99	96	84	26	3	A-4(2)	ML
feet east of the	-4	Bt2	20-32	104	19	100	100	97	86	42	21	A-7-6(18)	CL
northwest corner of	-7	2C	52-60	120	13	100	100	97	65	22	7	A-4(2)	CL-ML
sec. 22, T. 11 N.,													
R. 7 E.													
Starks silt loam:	82IL-029-22												
600 feet east and 1,300	-1	Ap	0-8	114	13	99	97	90	71	25	5	A-4(2)	CL-ML
feet north of the	-5	Bt3	26-36	99	22	99	98	93	83	46	26	A-7-6(22)	CL
southwest corner of	-7	2C	44-60	119	13	96	93	83	49	27	14	A-6(3)	CL
sec. 17, T. 11 N.,													
R. 7 E.													
Tice silty clay loam:	82IL-029-25												
800 feet west and 400	-1	Ap	0-7	102	20	100	100	99	95	44	20	A-7-6(21)	CL
feet north of the	-4	Bw2	20-31	105	20	100	100	99	92	44	24	A-7-6(23)	CL
southeast corner of													
sec. 11, T. 11 N.,													
R. 7 E.													
Wirt silt loam:	82IL-029-26												
390 feet west and 540	-1	Ap	0-9	114	14	100	100	99	70	26	7	A-4(3)	CL-ML
feet south of the	-3	Bw2	23-32	123	11	93	91	87	54	23	8	A-4(1)	CL
northeast corner of													
sec. 14, T. 11 N.,													
R. 9 E.													

TABLE 20.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Brenton	Fine-silty, mixed, mesic Aquic Argiudolls
Brooklyn	Fine, montmorillonitic, mesic Mollic Albaqualfs
Camden	Fine-silty, mixed, mesic Typic Hapludalfs
Dana	Fine-silty, mixed, mesic Typic Argiudolls
Drummer	Fine-silty, mixed, mesic Typic Haplaquolls
Fincastle	Fine-silty, mixed, mesic Aeric Ochraqualfs
Flanagan	Fine, montmorillonitic, mesic Aquic Argiudolls
Landes	Coarse-loamy, mixed, mesic Fluventic Hapludolls
Lawson	Fine-silty, mixed, mesic Cumulic Hapludolls
Lenzburg	Fine-loamy, mixed (calcareous), mesic Typic Udorthents
Martinsville	Fine-loamy, mixed, mesic Typic Hapludalfs
Miami	Fine-loamy, mixed, mesic Typic Hapludalfs
Millbrook	Fine-silty, mixed, mesic Udollic Ochraqualfs
Pella	Fine-silty, mixed, mesic Typic Haplaquolls
Peotone	Fine, montmorillonitic, mesic Cumulic Haplaquolls
Proctor	Fine-silty, mixed, mesic Typic Argiudolls
Raub	Fine-silty, mixed, mesic Aquic Argiudolls
Ross	Fine-loamy, mixed, mesic Cumulic Hapludolls
Russell	Fine-silty, mixed, mesic Typic Hapludalfs
Sawmill	Fine-silty, mixed, mesic Cumulic Haplaquolls
Shoals	Fine-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Starks	Fine-silty, mixed, mesic Aeric Ochraqualfs
*Thorp	Fine-silty, mixed, mesic Argiaquic Argialbolls
Tice	Fine-silty, mixed, mesic Fluvaquentic Hapludolls
Toronto	Fine-silty, mixed, mesic Udollic Ochraqualfs
Wingate	Fine-silty, mixed, mesic Mollic Hapludalfs
Wirt	Coarse-loamy, mixed, nonacid, mesic Typic Udifluvents
Xenia	Fine-silty, mixed, mesic Aquic Hapludalfs

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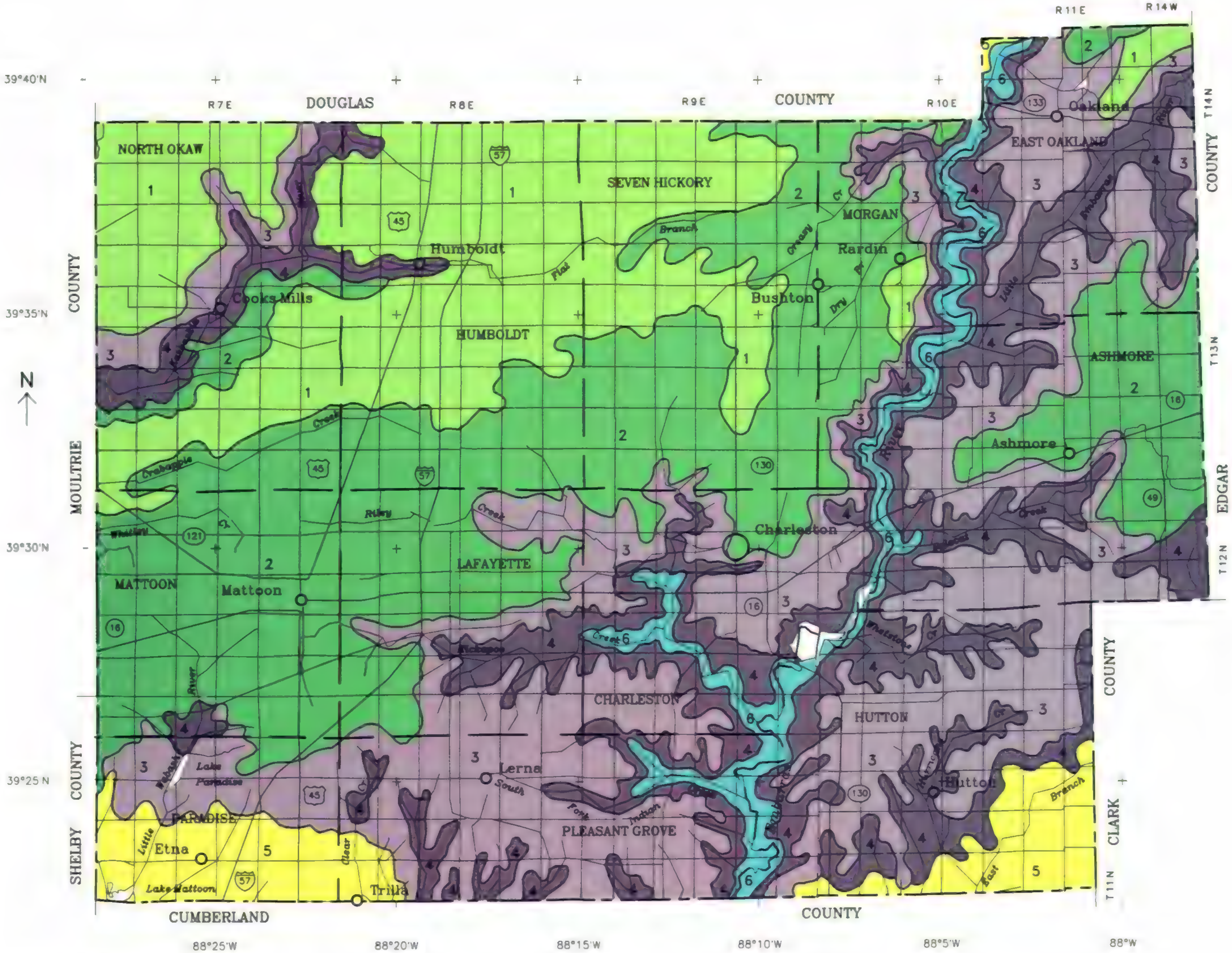


SOIL LEGEND*

1 — DRUMMER–FLANAGAN ASSOCIATION: Nearly level, poorly drained and somewhat poorly drained, silty soils formed in loess and glacial till or in loess and glacial outwash; on till plains

2 — DRUMMER–RAUB–DANA ASSOCIATION: Nearly level and gently sloping, poorly drained to moderately well drained, silty soils formed in loess and glacial outwash or in loess and glacial till; on till plains

3 — XENIA–FINCASTLE–TORONTO ASSOCIATION: Nearly level and gently sloping, moderately well drained and somewhat poorly drained, silty soils formed in loess and glacial till; on till plains

4 — MIAMI–RUSSELL ASSOCIATION: Gently sloping to very steep, well drained, loamy and silty soils formed in glacial till or in loess and glacial till; on till plains

5 — DRUMMER–STARKS–BROOKLYN ASSOCIATION: Nearly level and gently sloping, poorly drained and somewhat poorly drained, silty soils formed in loess and glacial outwash; on outwash plains and terraces

6 — LAWSON–LANDES–SAWMILL ASSOCIATION: Nearly level, somewhat poorly drained, well drained, and poorly drained, silty and loamy soils formed in alluvium; on flood plains

* The textural terms used in the descriptive headings refer to the surface layer of the major soils in the association.

Compiled 1986

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ILLINOIS AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

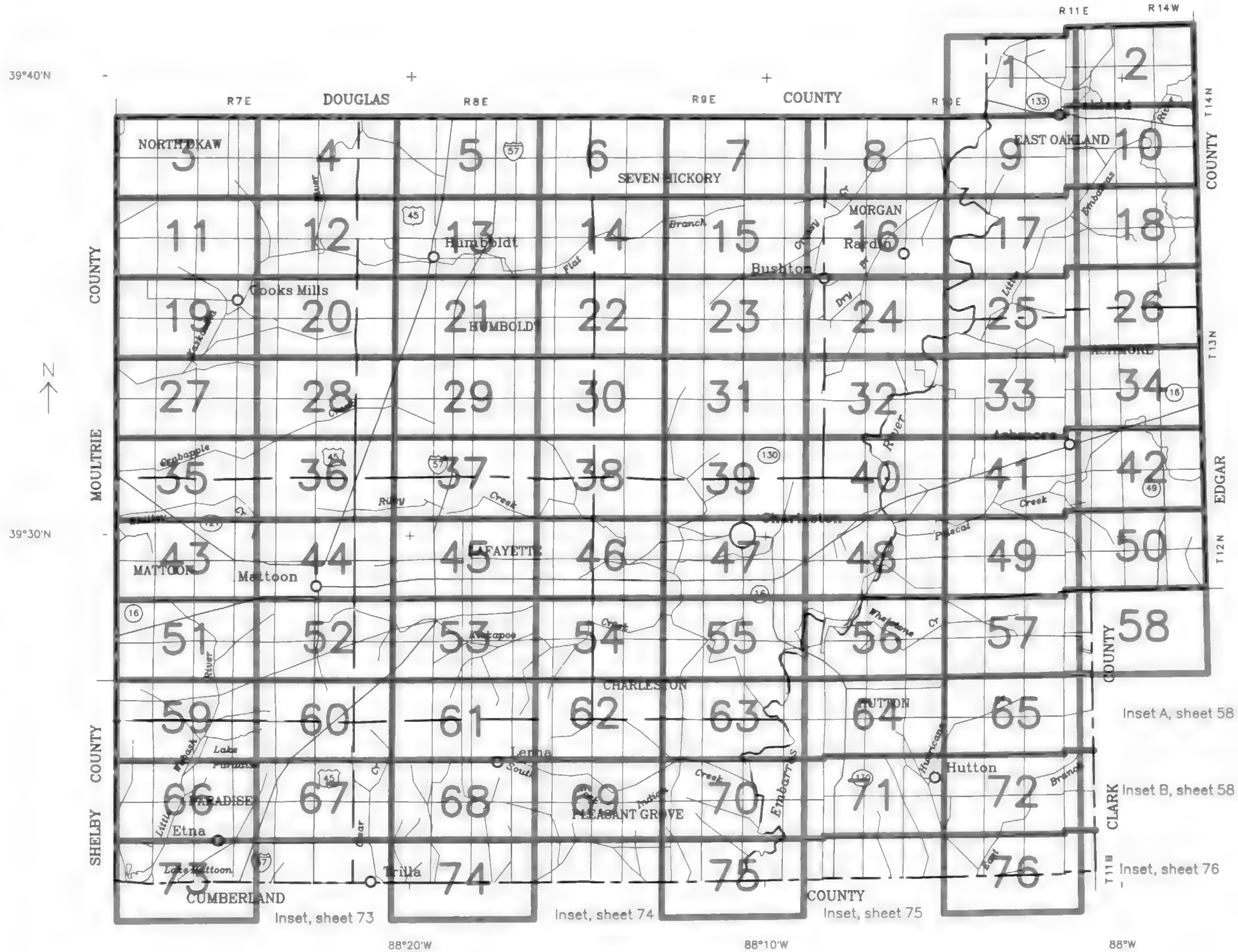
COLES COUNTY, ILLINOIS

1 0 1 2 3 4 MILES

1 0 1 2 3 4 KILOMETERS

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

Map prepared using Automated Map Construction. U.T.M. Projection – National Cartography and GIS Center, Fort Worth, Texas 1992



Original text from each individual map sheet read:

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1982 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS

COLES COUNTY, ILLINOIS

1 0 1 2 3 4 MILES

1 0 1 2 3 4 KILOMETERS

Map prepared using Automated Map Construction.
U.T.M. Projection — National Cartography and GIS Center, Fort Worth, Texas 1992

SOIL LEGEND

Map symbols consist of numbers or a combination of numbers and a letter. The initial numbers represent the kind of soil. A capital letter following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 following the slope letter indicates that the soil is moderately eroded and 3 that it is severely eroded.

SYMBOL	NAME
27C2	Miami loam, 5 to 10 percent slopes, eroded
27C3	Miami loam, 5 to 10 percent slopes, severely eroded
27D2	Miami loam, 10 to 15 percent slopes, eroded
27D3	Miami loam, 10 to 15 percent slopes, severely eroded
27E	Miami loam, 15 to 30 percent slopes
27G	Miami loam, 30 to 60 percent slopes
56B	Dana silt loam, 2 to 5 percent slopes
56B2	Dana silt loam, 2 to 5 percent slopes, eroded
73	Ross loam
107	Sawmill silty clay loam
132A	Starks silt loam, 0 to 2 percent slopes
132B	Starks silt loam, 2 to 5 percent slopes
134B	Camden silt loam, 1 to 5 percent slopes
136	Brooklyn silt loam
148B	Proctor silt loam, 1 to 5 percent slopes
149	Brenton silt loam
152	Drummer silty clay loam
153	Pella silty clay loam
154	Flanagan silt loam
206	Thorp silt loam
219	Millbrook silt loam
226	Wirt silt loam
284	Tice silty clay loam
291B	Xenia silt loam, 1 to 5 percent slopes
304	Landes fine sandy loam
322B	Russell silt loam, 1 to 5 percent slopes
322C2	Russell silt loam, 5 to 10 percent slopes, eroded
330	Peotone silty clay loam
348B	Wingate silt loam, 2 to 5 percent slopes
353	Toronto silt loam
424	Shoals loam
451	Lawson silt loam
481	Raub silt loam
496	Fincastle silt loam
533	Urban land
570B	Martinsville silt loam, 1 to 5 percent slopes
570C2	Martinsville silt loam, 5 to 12 percent slopes, eroded
864	Pits, quarry
871B	Lenzburg gravelly loam, 1 to 5 percent slopes
871D	Lenzburg loam, 7 to 20 percent slopes
2152	Drummer-Urban land complex
2291B	Xenia-Urban land complex, 1 to 5 percent slopes
2481	Raub-Urban land complex
2496	Fincastle-Urban land complex

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES
- National, state, or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline and neatline

AD HOC BOUNDARY (label)
- Small airport, airfield, park, oilfield, cemetery, or flood pool

STATE COORDINATE TICK

LAND DIVISION CORNER (sections and land grants)

ROADS
- Divided (median shown if scale permits)
- [illegible]
- Trail

ROAD EMBLEM & DESIGNATIONS
- Interstate 173
- Federal 173
- State
- County, farm or ranch 1289

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES
- Without road
- With road
- With railroad

DAMS
- Large (to scale)
- Medium or Small

PITS
- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES
- Farmstead, house (omit in urban area)
- Church
- School
- Indian mound (label) — Indian Mound
- Located object (label) — Tower
- Tank (label) — Gas
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE
- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
- Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS
- Perennial
- Intermittent

MISCELLANEOUS WATER FEATURES
- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS

ESCARPMENTS
- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

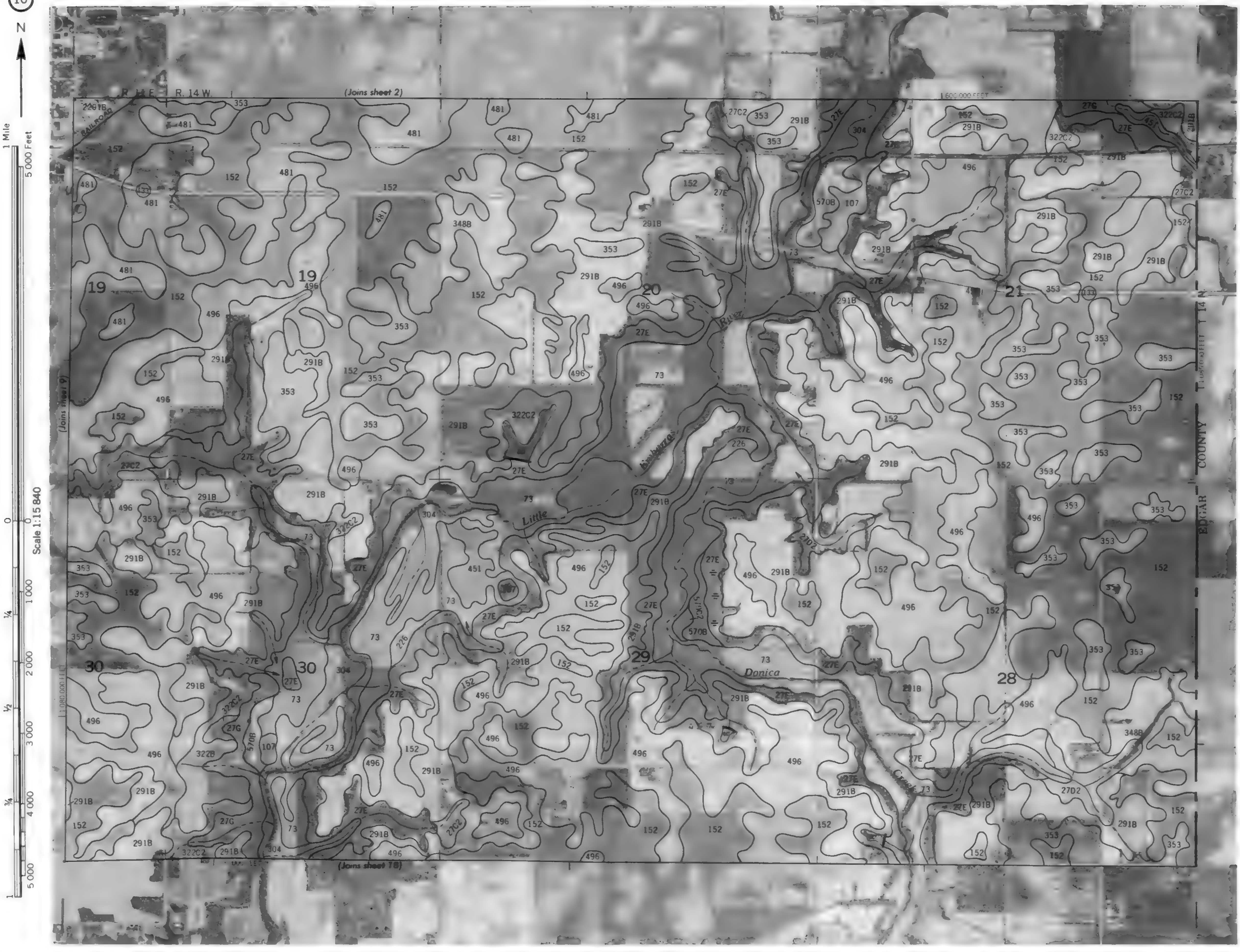
GULLY

DEPRESSION OR SINK

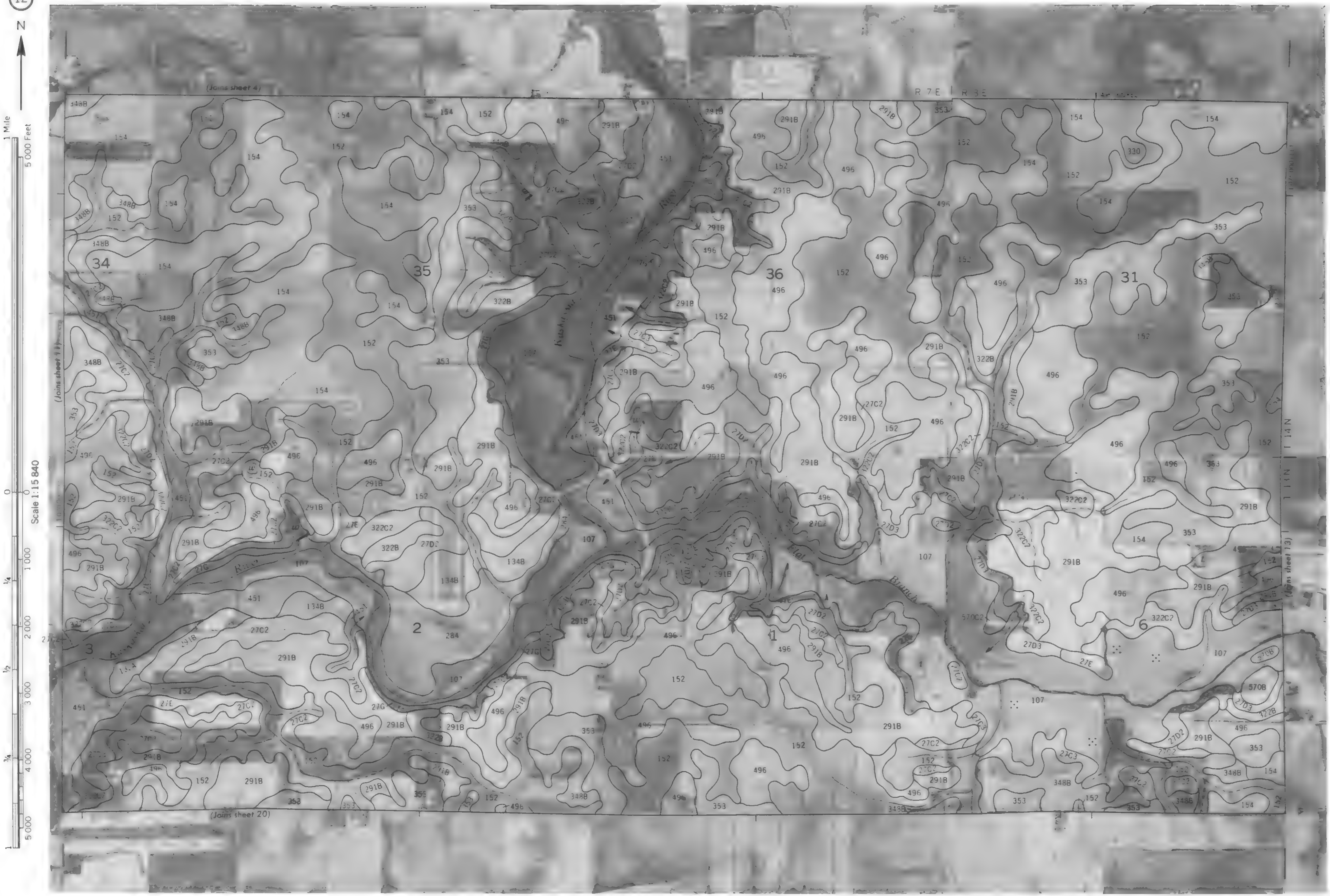
SOIL SAMPLE (normally not shown)

MISCELLANEOUS
- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot

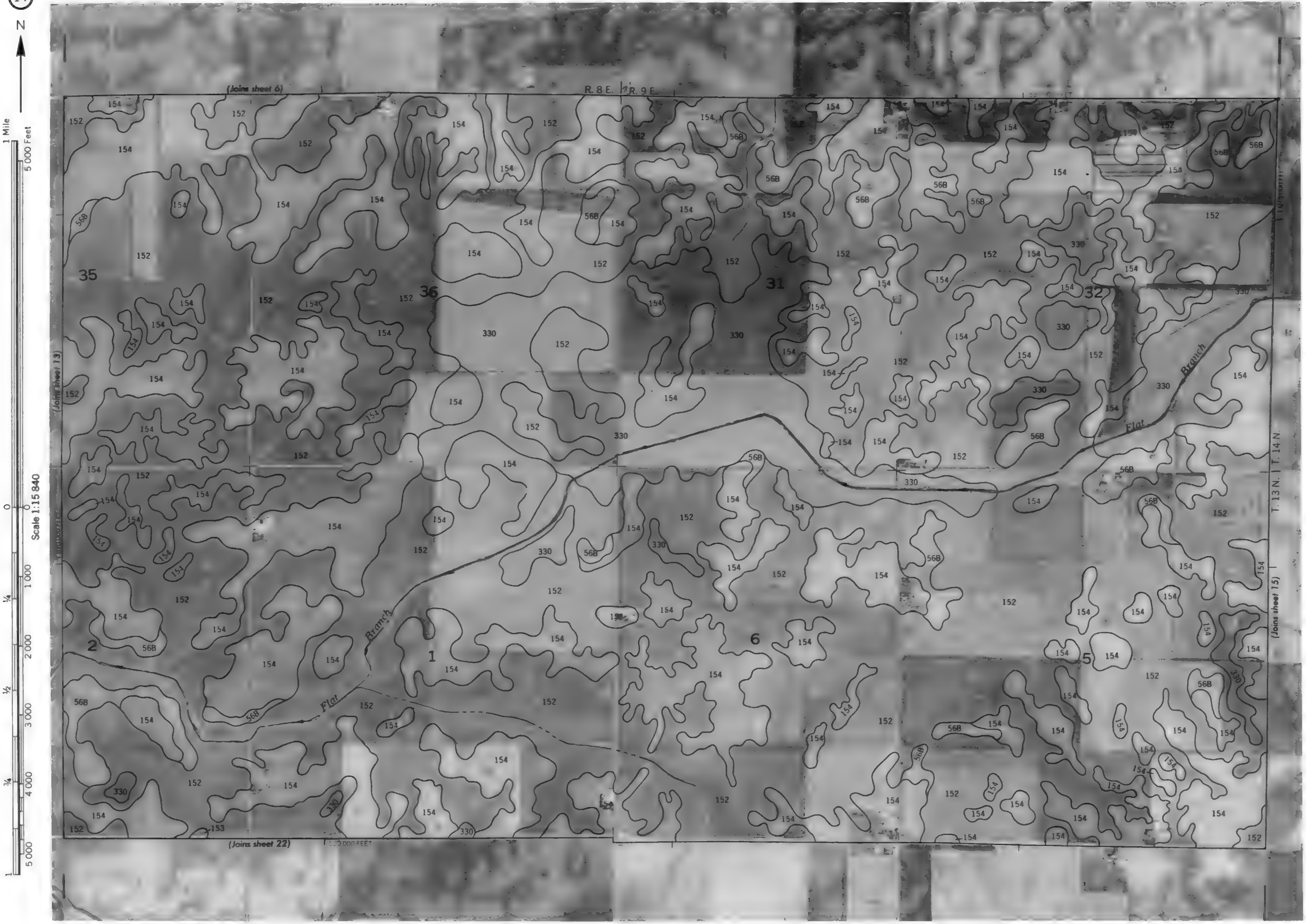

1
N
R. 10 E. | R. 11 E.
DOUGLAS COUNTY
DOUGLAS COUNTY
T. 14 N.
EMBARRAS RIVER
(Joins sheet 2)
(Joins sheet 9)
CEMETERY
1 Mile
5 000 Feet
Scale 1:15 840


N
1 Mile
5 000 Feet
Scale 1:15 840
0
1/4
1/2
3/4
1
1 000
2 000
3 000
4 000
5 000
R. 14 W.
(Joins sheet 2)
(Joins sheet 9)
(Joins sheet 18)
RAILROAD
1 600 000 FEET
1 080 000 FEET
EDGAR COUNTY
T. 14 N.
19
20
21
28
29
30
Little
River
Donica
Creek
Brushy Fork
152
291B
353
481
496
27E
73
322C2
304
570B
107
348B
451
226
27G
27D2
322B
133


11
N
R 7 E
(Joins sheet 3)
(Joins sheet 12)
(Joins sheet 19)
MOULTRIE COUNTY
T 14 N
T 13 N
31
32
33
34
6
5
4
3
1 Mile
5 000 Feet
1/4
1/2
3/4
0
1 000
2 000
3 000
4 000
5 000
Scale 1:15 840


N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 4)
(Joins sheet 20)
(Joins sheet 13)
R 7 E
R 8 E
T 14 N
T 13 N
34
35
36
31
2
1
6
3
Kaskaskia River
Flat Branch

(Joins sheet 5)
R. 8 E.
T. 14 N.
T. 13 N.
32
33
34
35
5
4
3
2
Humboldt
Flat Branch
Branch
RAILROAD
(Joins sheet 12)
(Joins sheet 14)
(Joins sheet 21)
N
1 Mile
5 000 Feet
Scale 1:15 840

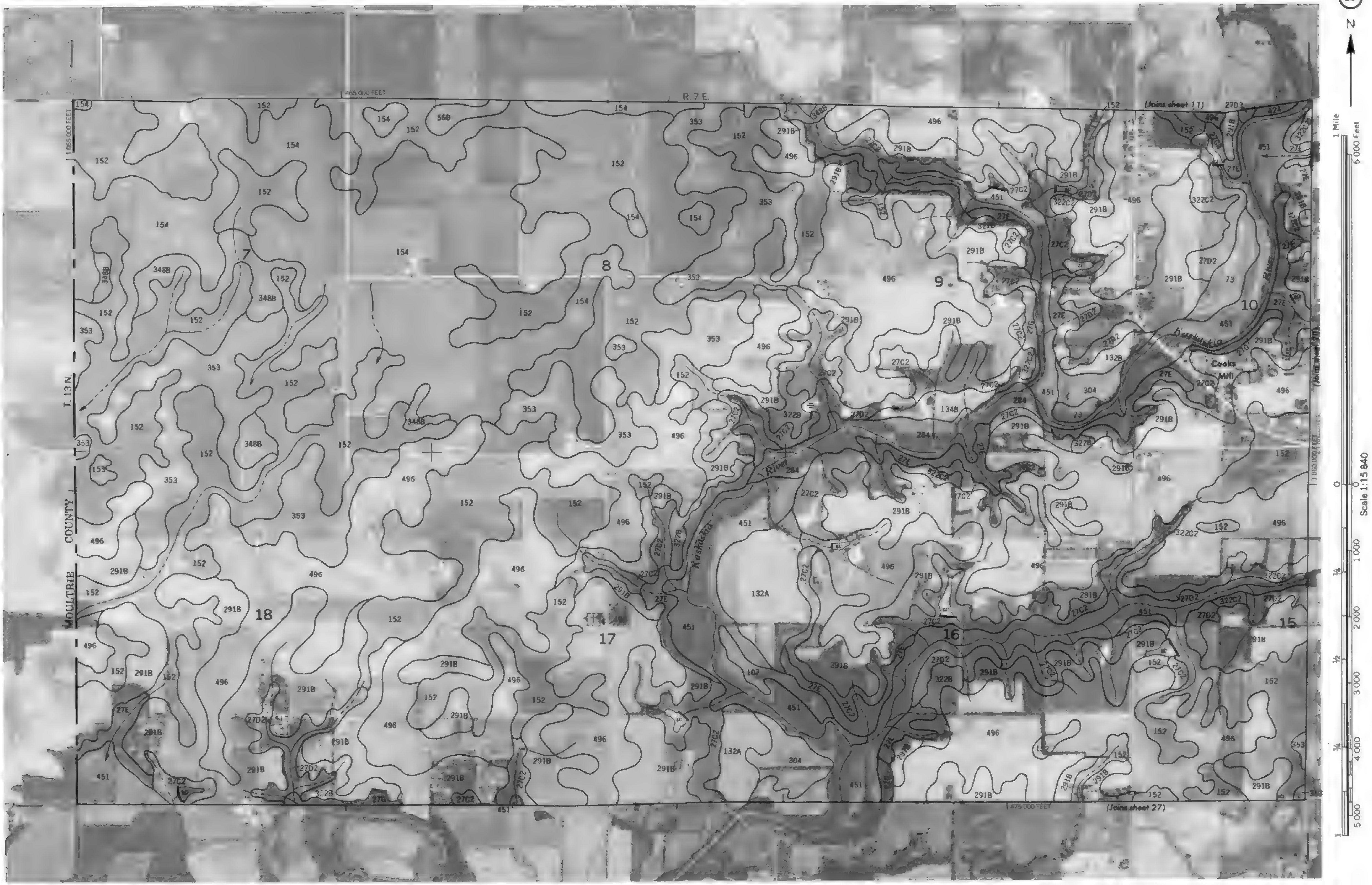

N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 6)
R. 8 E.
R. 9 E.
(Joins sheet 13)
(Joins sheet 15)
(Joins sheet 22)
T. 14 N.
T. 13 N.
Flat Branch
Flat Branch
35
36
31
32
2
1
6
5
152
154
56B
330
153


R. 9 E.
(Joins sheet 7)
(Joins sheet 23)
(Joins sheet 14)
(Joins sheet 16)
T. 14 N.
T. 13 N.
1 535 000 FEET
33
34
35
36
4
3
2
1
N
Scale 1:15 840
1 Mile
5 000 Feet
0
1/4
1/2
3/4
1 000
2 000
3 000
4 000
5 000

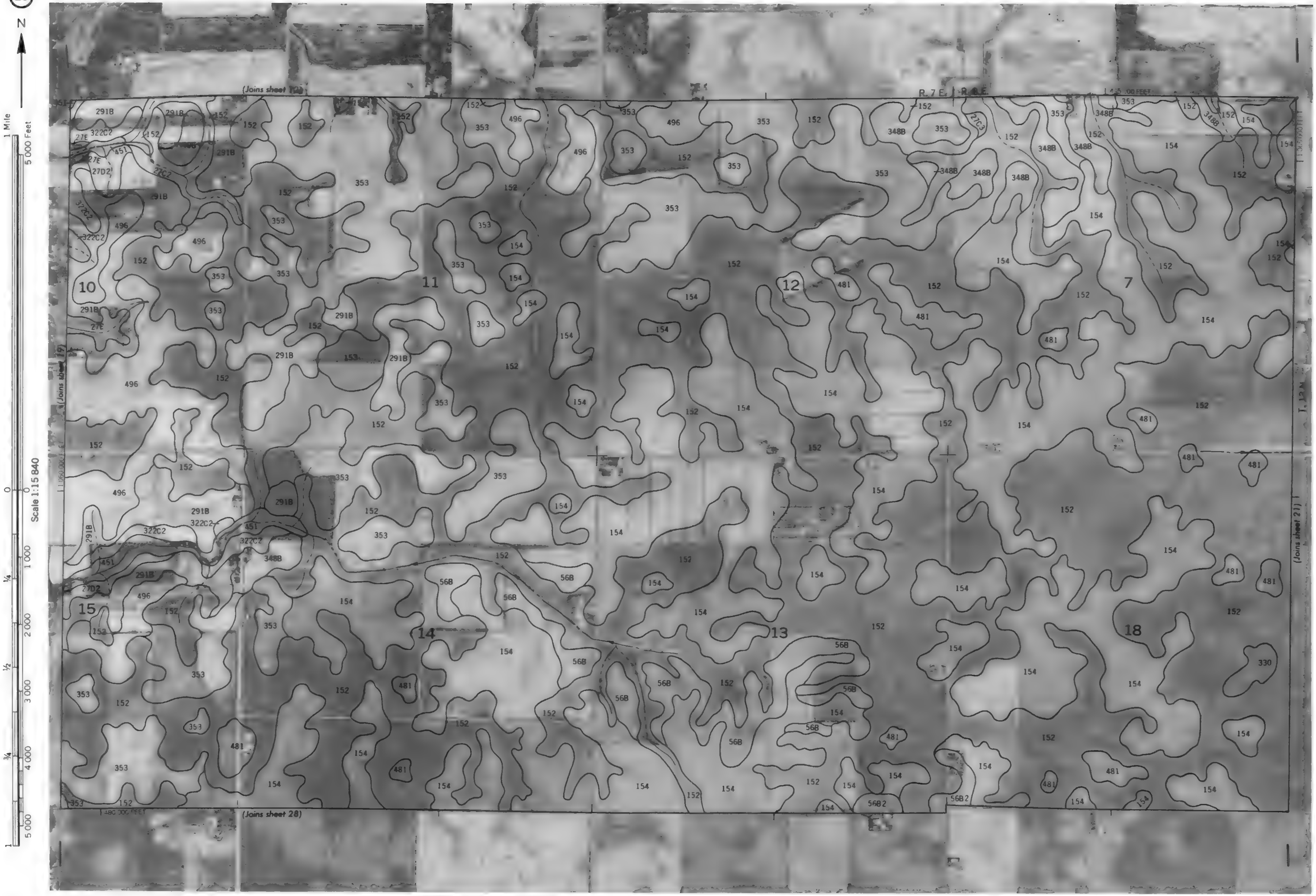

N
1 Mile
5 000 Feet
Scale 1:15 840
R 9 E.
R. 10 E.
(Joins sheet 8)
(Joins sheet 24)
(Joins sheet 15)
(Joins sheet 17)
T. 14 N.
T. 13 N.
36
31
32
33
1
6
5
4
Creek
Greasy
Branch
RAILROAD


17
N
R. 10 E.
R. 11 E.
(Joins sheet 9)
(Joins sheet 16)
(Joins sheet 25)
T. 14 N.
T. 13 N.
EMBARRAS
RIVER
Little Embarras River
RAILROAD
1 075 000 FEET
585 000 FEET
34
35
36
31
3
2
1
6
water
1 Mile
5 000 Feet
Scale 1:15 840
0
1/4
1/2
3/4
1
1 000
2 000
3 000
4 000
5 000


18
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 10)
(Joins sheet 17)
(Joins sheet 26)
R. 11 E. | R. 14 W.
T. 14 N.
T. 13 N.
EDGAR COUNTY
31
32
33
6
5
4

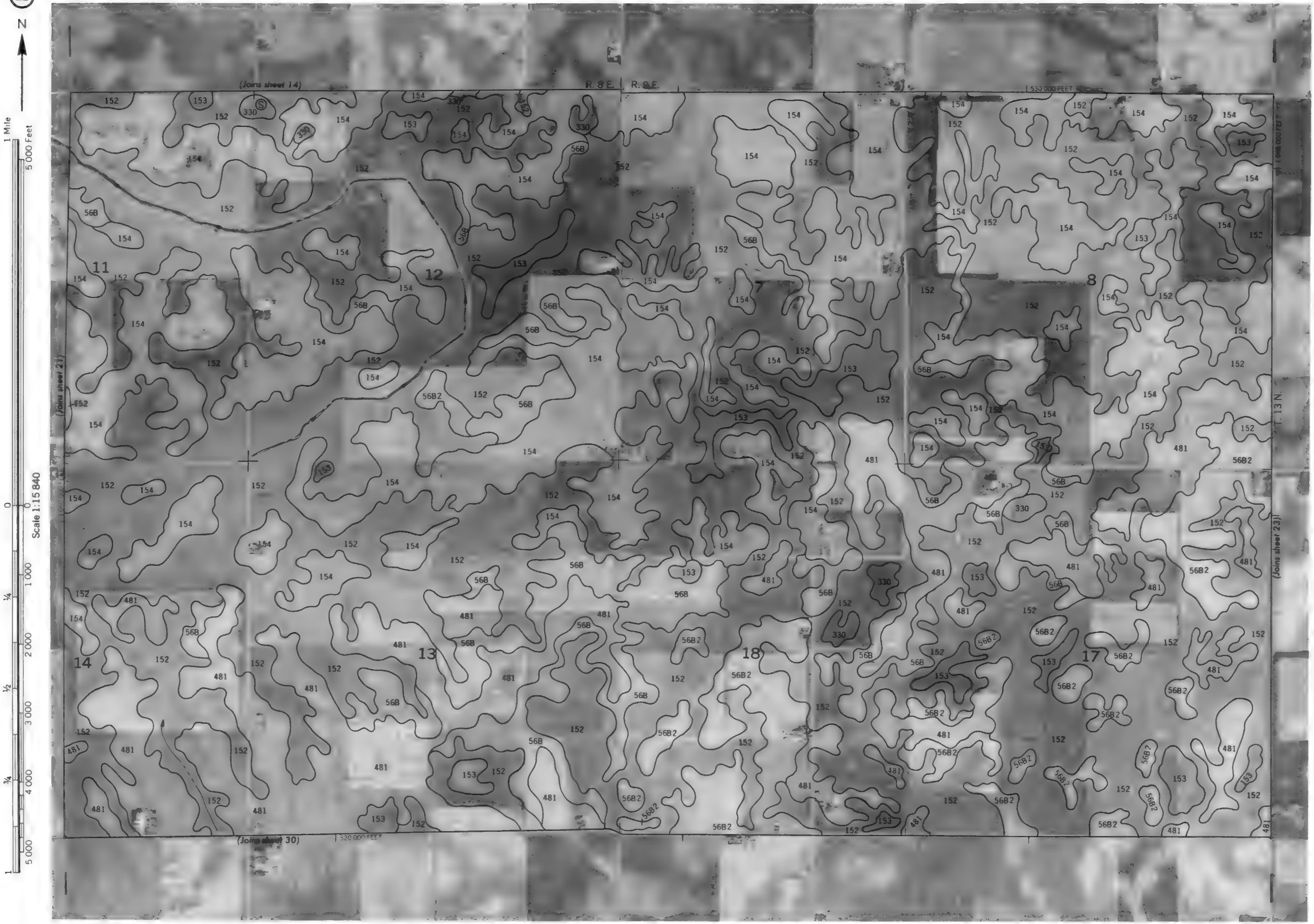

19
N
R. 7 E.
T. 13 N.
MOULTRIE COUNTY
465 000 FEET
475 000 FEET
1 065 000 FEET
1 060 000 FEET
(Joins sheet 11)
(Joins sheet 27)
(Joins sheet 20)
Kaskaskia River
Cooks Mill
7
8
9
10
15
16
17
18
1 Mile
5 000 Feet
Scale 1:15 840

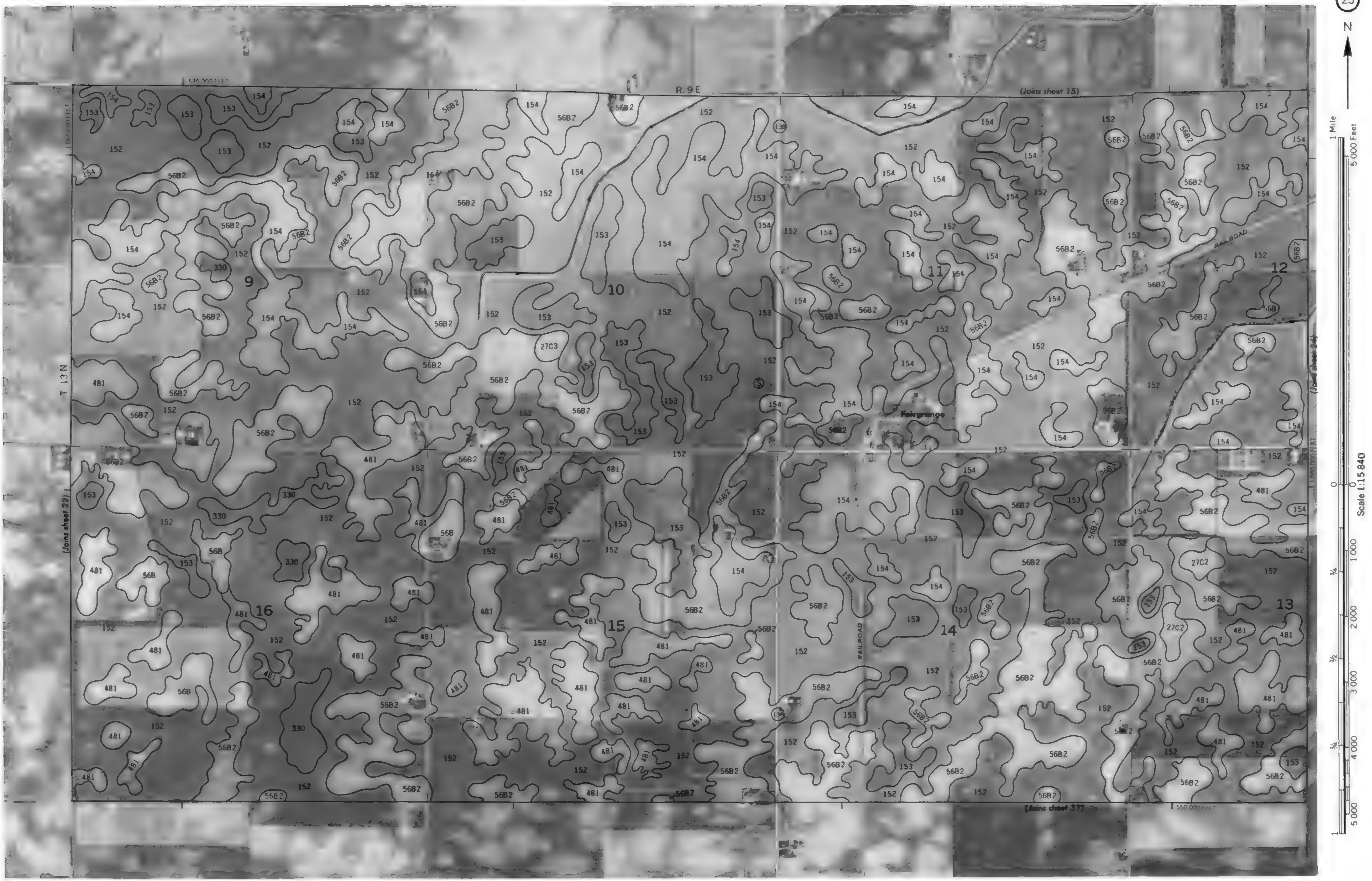

2
N
1 Mile
5 000 Feet
Scale 1:15 840
R. 11 E.
R. 14 W.
DOUGLAS COUNTY
EDGAR COUNTY
T. 14 N.
(Joins sheet 1)
(Joins sheet 10)
Lake Oakland
OAKLAND
RAILROAD
Embarras River
Little
7
8
9
16
17
18


N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 12)
R. 7 E. | R. 8 E.
(Joins sheet 19)
(Joins sheet 21)
(Joins sheet 28)
T. 12 N.
10
11
12
7
15
14
13
18

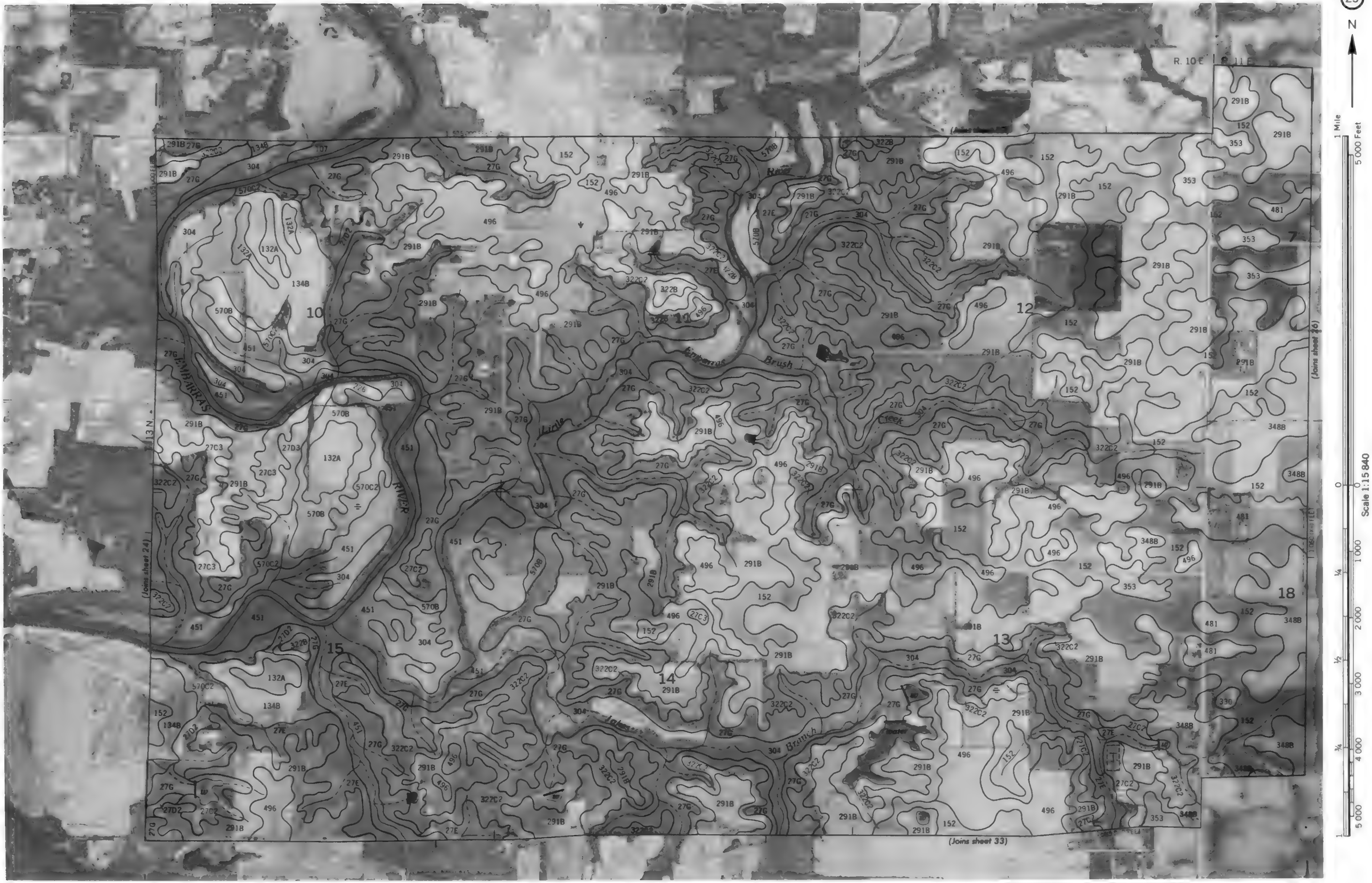
21


R 8 E
T. 13 N
(Joins sheet 13)
(Joins sheet 20)
(Joins sheet 22)
(Joins sheet 29)
RAILROAD
8
9
10
11
14
15
16
17
N
1 Mile
5 000 Feet
Scale 1:15 840
0
1000
2000
3000
4000
5000
¼
½
¾


N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 14)
R. 8 E.
R. 9 E.
530 000 FEET
1 068 000 FEET
T. 13 N.
(Joins sheet 21)
(Joins sheet 23)
(Joins sheet 30)
520 000 FEET
11
12
7
8
14
13
18
17


23
N
R. 9 E.
(Joins sheet 15)
T 13 N
(Joins sheet 22)
(Joins sheet 24)
(Joins sheet 31)
Fairgrange
RAILROAD
9
10
11
12
13
14
15
16
1 Mile
5 000 Feet
Scale 1:15 840


N
1 Mile
5 000 Feet
Scale 1:15 840
R 9 E | R 10 E
(Joins sheet 16)
(Joins sheet 23)
(Joins sheet 25)
(Joins sheet 32)
T 13 N
RAILROAD
EMBARRAS
7
8
9
12
13
16
17
18


R. 10 E.
R. 11 E.
T. 13 N.
(Joins sheet 24)
(Joins sheet 26)
(Joins sheet 33)
EMBARRAS
RIVER
Little
Brush
Creek
Branch
water
7
10
11
12
13
14
15
18
N
1 Mile
5 000 Feet
Scale 1:15 840
0
1 000
2 000
3 000
4 000
5 000
1/4
1/2
3/4
1

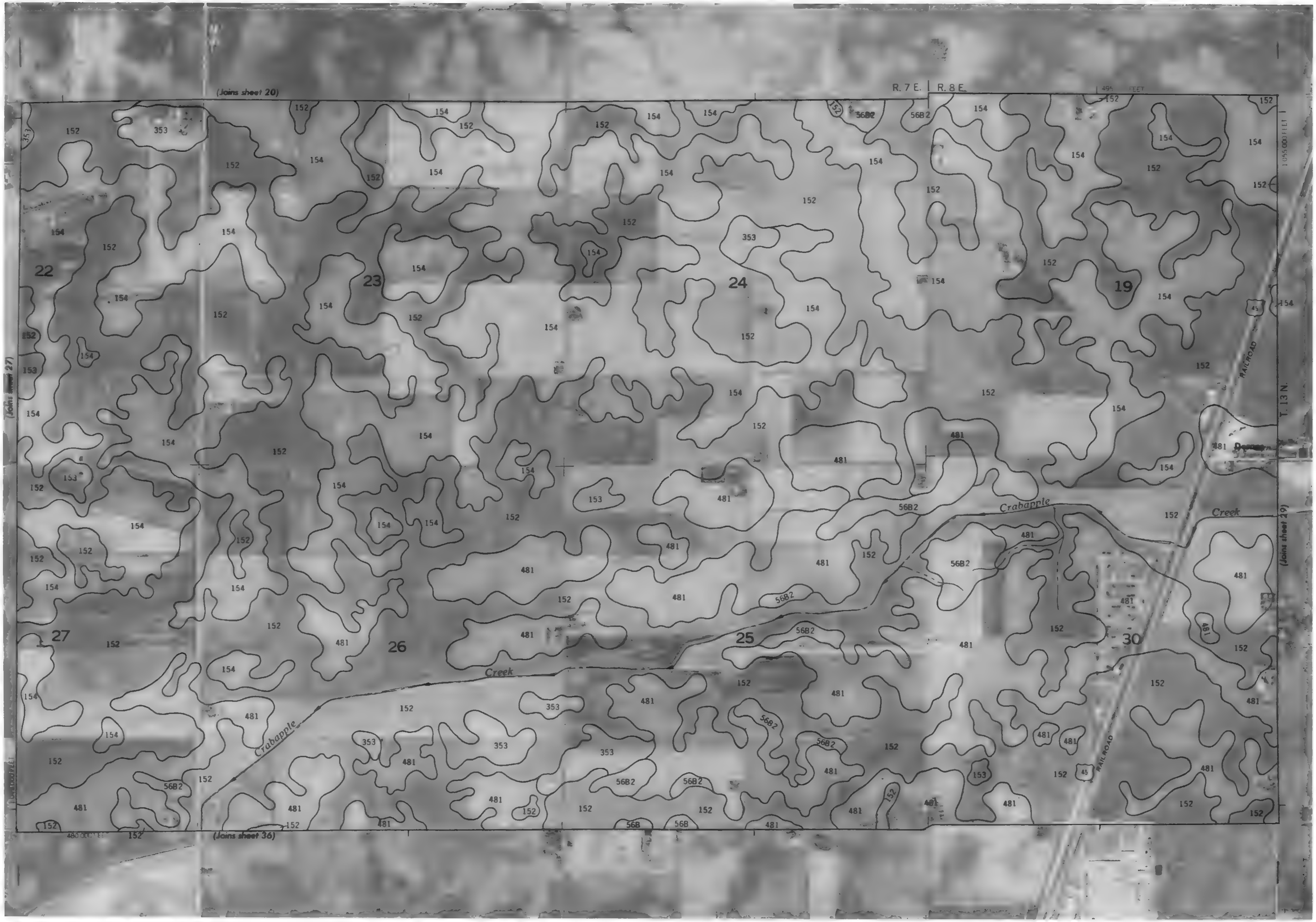

N
1 Mile
5 000 Feet
Scale 1:15 840
R. 11 E.
R. 14 W.
(Joins sheet 18)
(Joins sheet 25)
(Joins sheet 34)
EDGAR COUNTY
T. 13 N.
West Creek
Donica Creek
7
8
9
16
17
18
152
153
27C2
291B
348B
353
451
481


27
N
(Joins sheet 19)
(Joins sheet 35)
(Joins sheet 28)
R. 7 E.
T. 13 N.
MOULTRIE COUNTY
Kaskaskia River
water
19
20
21
22
27
28
29
30
1 Mile
5 000 Feet
Scale 1:15 840
0
¼
½
¾
1
1 000
2 000
3 000
4 000
5 000
1 045 000 FEET
475 000 FEET

SOIL SURVEY OF COLES COUNTY, ILLINOIS — SHEET NUMBER 28

N

1 Mile
5 000 Feet
0
Scale 1:15 840
1 000
1/4
2 000
1/2
3 000
3/4
4 000
5 000
1



29


(Joins sheet 21)
(Joins sheet 28)
(Joins sheet 37)
R 8 E
T 13 N
Crabapple
Creek
20
21
22
23
26
27
28
29
N
1 Mile
5 000 Feet
Scale 1:15 840


3
N
DOUGLAS COUNTY
R 7 E.
MOULTRIE COUNTY
T 14 N
19
20
21
22
27
28
29
30
(Joins sheet 9)
1 Mile
5 000 Feet
Scale 1:15 840

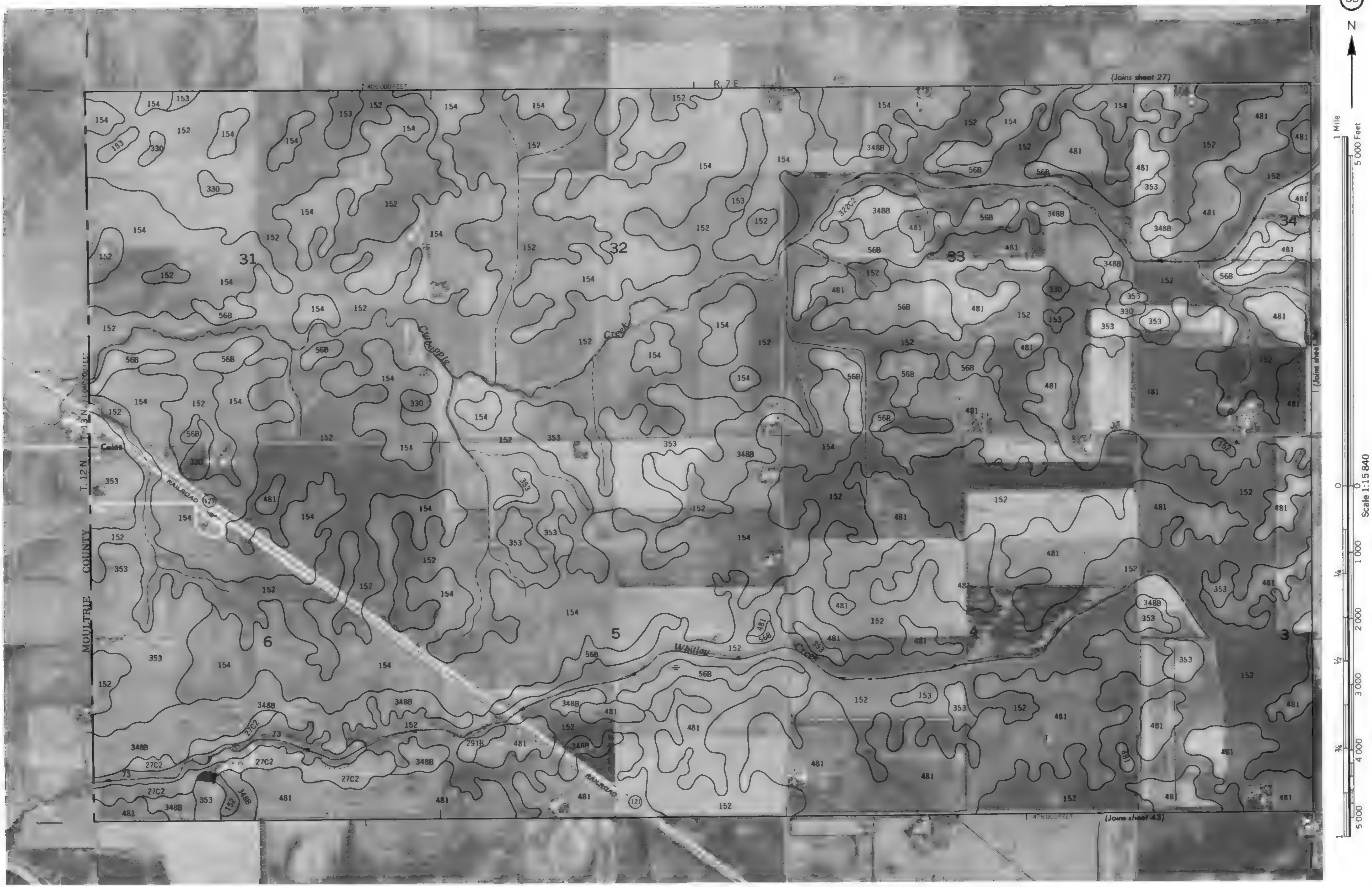

30
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 22)
(Joins sheet 38)
(Joins sheet 29)
(Joins sheet 31)
R 8 E.
R 9 E.
T. 13 N.
District No. 3
Union
19
20
23
24
25
26
29
30
152
153
481
56B2
353
330
27C2

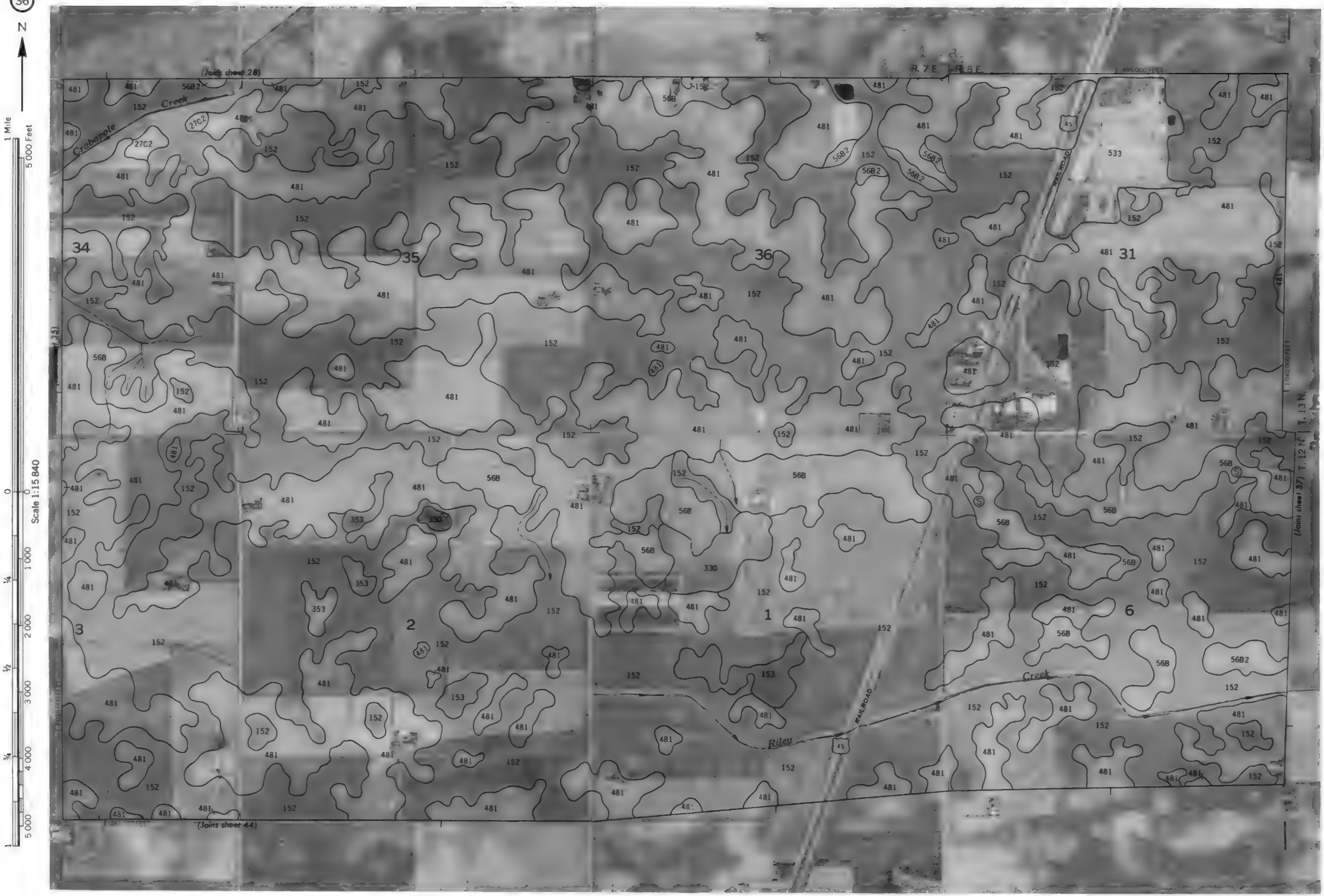

31
N
R. 9 E.
(Joins sheet 23)
(Joins sheet 39)
(Joins sheet 30)
T. 13 N.
RAILROAD
21
22
23
24
25
26
27
28
152
153
481
56B2
27C2
27C3
330
353
1 Mile
5 000 Feet
Scale 1:15 840
0
1 000
2 000
3 000
4 000
5 000
¼
½
¾
1

SOIL SURVEY OF COLES COUNTY, ILLINOIS — SHEET NUMBER 32

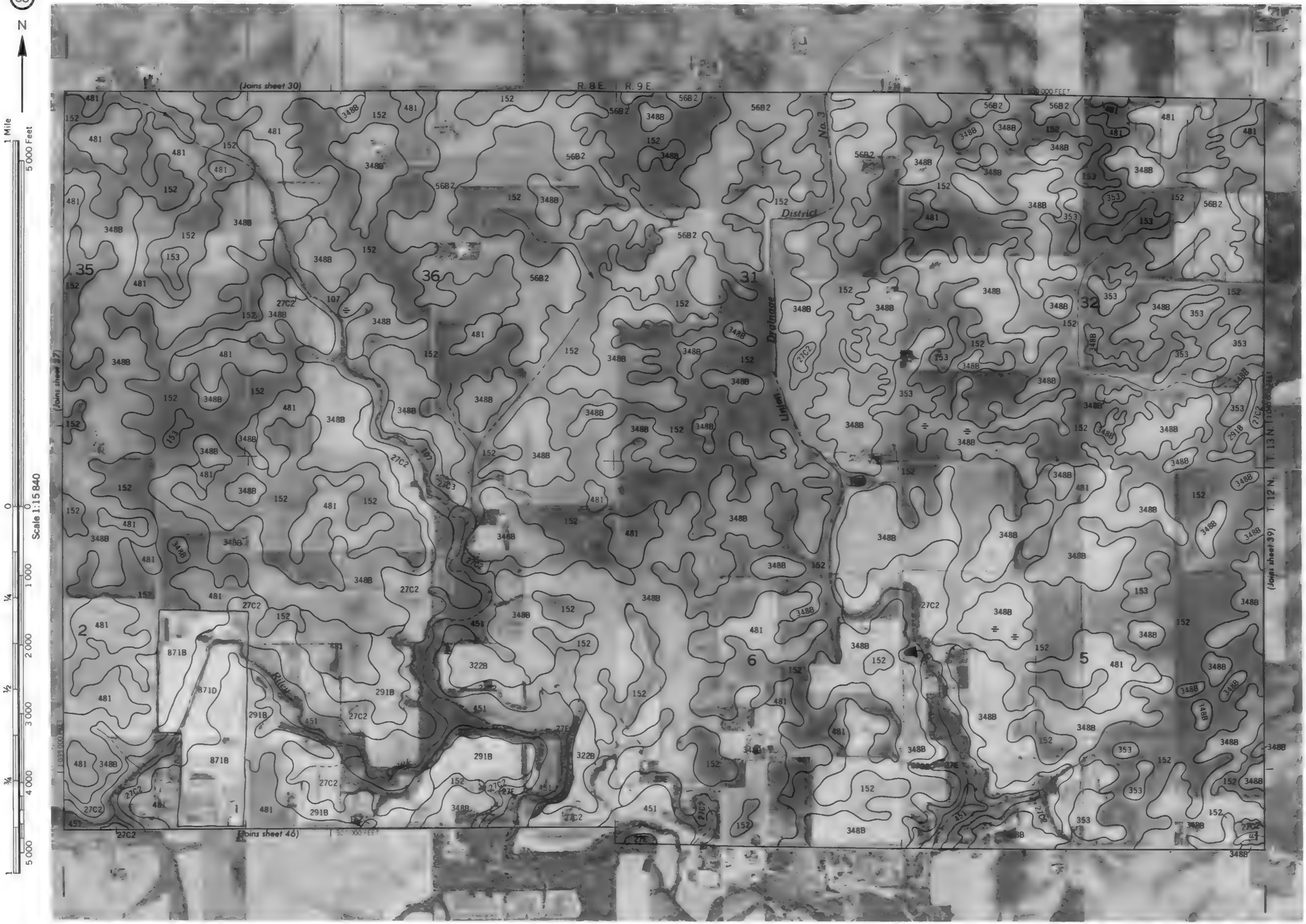
N
(Joins sheet 25)
R. 10 E. | R. 11 E.
T. 13 N.
(Joins sheet 32)
(Joins sheet 34)
(Joins sheet 41)
19
22
23
24
25
26
27
30
1 Mile
5 000 Feet
Scale 1:15 840


N
1 Mile
5 000 Feet
Scale 1:15 840
R. 11 E.
R. 14 W.
(Joins sheet 26)
(Joins sheet 33)
(Joins sheet 42)
T. 13 N.
EDGAR COUNTY
19
20
21
28
29
30
Polecat Creek
RAILROAD
152
348B
481
353
27C2
153


35
N
(Joins sheet 27)
(Joins sheet 43)
R. 7 E.
T. 12 N.
T. 13 N.
MOULTRIE COUNTY
Coles
RAILROAD
Crabapple Creek
Whitley Creek
31
32
33
34
6
5
4
3
1 Mile
5 000 Feet
Scale 1:15 840


N
1 Mile
5 000 Feet
0
Scale 1:15 840
(Joins sheet 28)
(Joins sheet 44)
(Joins sheet 37)
R. 7 E. | R. 8 E.
495 000 FEET
1 040 000 FEET
T. 13 N.
T. 12 N.
Crabapple Creek
Riley Creek
RAILROAD
45
34
35
36
31
3
2
1
6
481
152
56B
56B2
27C2
533
353
330
153


(Joins sheet 29)
R. 8 E.
(Joins sheet 36)
T 13 N
T 12 N
(Joins sheet 45)
Riley Creek
N
1 Mile
5 000 Feet
Scale 1:15 840


N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 30)
(Joins sheet 37)
(Joins sheet 39)
(Joins sheet 46)
R. 8 E.
R. 9 E.
T. 13 N.
T. 12 N.
District
No. 3
Union Drainage
Riley
35
36
31
32
2
6
5


N
R. 9 E.
(Joins sheet 31)
(Joins sheet 38)
(Joins sheet 47)
T. 13 N.
T. 12 N.
33
34
35
36
4
3
2
1
RAILROAD
CEMETERY
Cassell Creek
1 Mile
5 000 Feet
Scale 1:15 840
0
1/4
1/2
3/4
1 000
2 000
3 000
4 000
5 000


4
N
1 Mile
5 000 Feet
Scale 1:15 840
0
1000
2000
3000
4000
5000
¼
½
¾
1
DOUGLAS COUNTY
R 7 E
R 8 E
T 14 N
(Joins sheet 5)
(Joins sheet 12)
Kaskaskia River
22
23
24
19
25
26
27
30


40
N
1 Mile
5 000 Feet
Scale 1:15 840
R 9 E | R 10 E | (Joins sheet 32)
(Joins sheet 39)
(Joins sheet 41)
(Joins sheet 48)
T 13 N.
T 12 N.
EMBARRAS RIVER
RAILROAD
water
36
31
32
33
1
6
5
4


41
N
R. 10 E.
R. 11 E.
(Joins sheet 33)
(Joins sheet 40)
(Joins sheet 49)
T. 13 N.
T. 12 N.
RAILROAD
Ashmore
Polecat Creek
Dudley Branch
water
34
35
36
31
1
2
3
6
1 Mile
5 000 Feet
Scale 1:15 840


N
R. 11 E.
R. 14 W.
(Joins sheet 34)
600 000 FEET
Ashmore
Polecat
Creek
31
32
33
4
5
6
EDGAR
COUNTY
T. 13 N.
T. 12 N.
(Joins sheet 41)
(Joins sheet 50)
590 000 FEET
1 Mile
5 000 Feet
Scale 1:15 840


43
N
(Joins sheet 35)
(Joins sheet 51)
(Joins sheet 44)
R. 7 E.
MOULTRIE COUNTY T. 12 N.
465 000 FEET
475 000 FEET
RAILROAD
MATTOON
7
8
9
10
15
16
17
18
1 Mile
5 000 Feet
Scale 1:15 840


N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 36)
R. 7 E. | R. 8 E.
(Joins sheet 43)
(Joins sheet 45)
(Joins sheet 57)
T. 12 N.
MATTOON
CEMETERY
RAILROAD
10
11
12
7
15
14
13
18
481
152
56B
56B2
2152
2481
533
871B

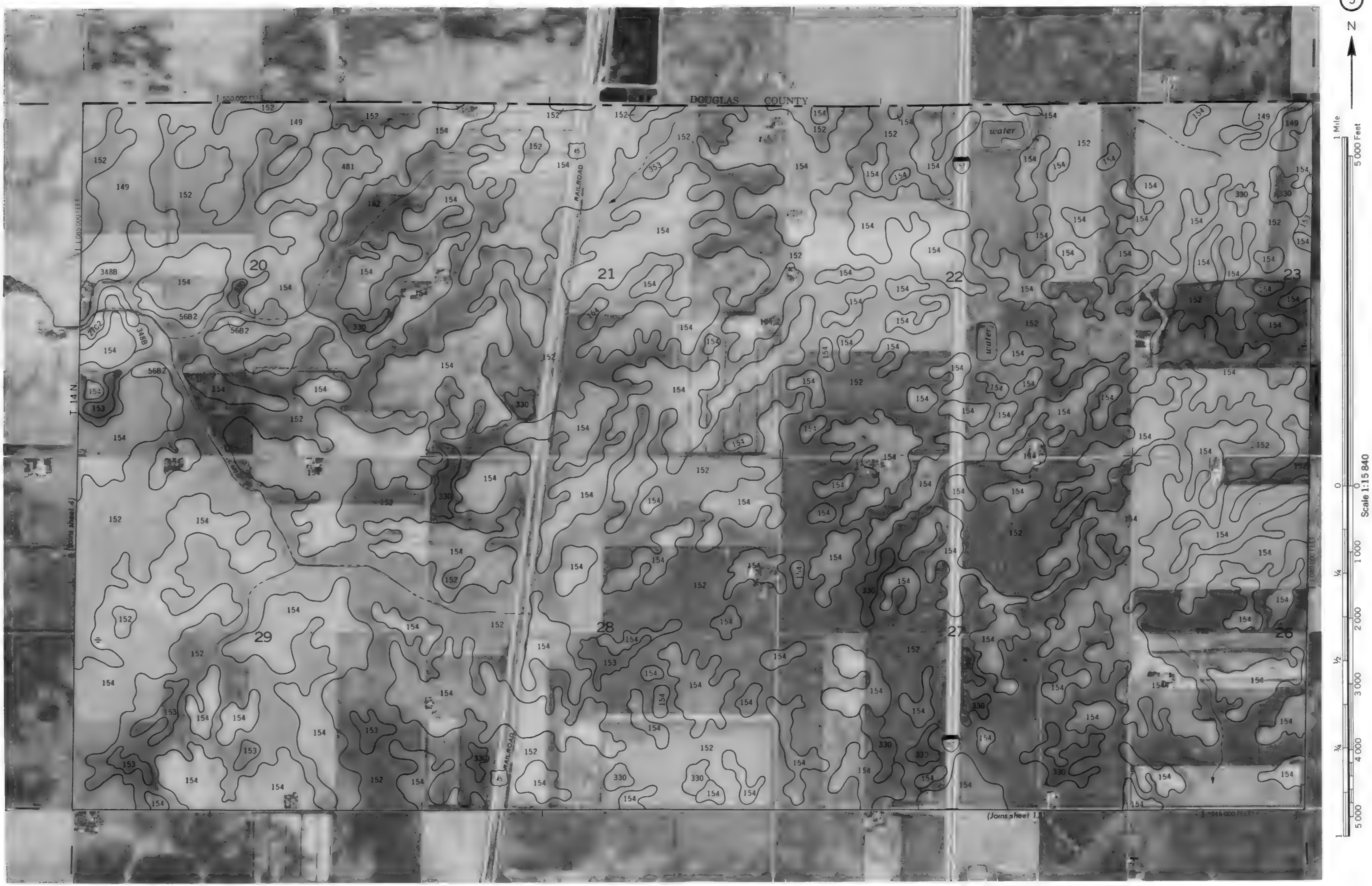

45
N
R. 8 E.
T. 12 N.
(Joins sheet 37)
(Joins sheet 53)
(Joins sheet 44)
(Joins sheet 46)
RAILROAD
CEMETERY
water
COLES COUNTY MEMORIAL AIRPORT
8
9
10
11
14
15
16
17
1 Mile
5 000 Feet
Scale 1:15 840


N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 38)
(Joins sheet 54)
(Joins sheet 47)
R. 8 E.
Riley Creek
RAILROAD
Loxa
COLES COUNTY
MEMORIAL AIRPORT
11
12
7
8
13
14
17
18


47
N
CHARLESTON
(county seat)
(Joins sheet 39)
(Joins sheet 46)
(Joins sheet 55)
T. 12 N.
SEWAGE LAGOON
CEMETERY
RAILROAD
Cassell Creek
Riley Creek
9
10
11
12
13
14
15
16
1 Mile
5 000 Feet
Scale 1:15 840
0
1/4
1/2
3/4
1
0
1000
2000
3000
4000
5000


N
1 Mile
5 000 Feet
Scale 1:15 840
R. 9 E. | R. 10 E.
(Joins sheet 40)
(Joins sheet 47)
(Joins sheet 49)
(Joins sheet 56)
T. 12 N.
EMBARRAS
RIVER
Polecat Creek
Rattlesnake Creek
12
13
18
7
8
9
17
16


N
R. 10 E.
R. 11 E.
T. 12 N.
(Joins sheet 41)
(Joins sheet 48)
(Joins sheet 50)
(Joins sheet 57)
Polecat Creek
Dudley Branch
10
11
12
7
13
14
15
18
1 Mile
5 000 Feet
Scale 1:15 840


5
N
DOUGLAS COUNTY
RAILROAD
water
T. 14 N.
(Joins sheet 4)
(Joins sheet 13)
20
21
22
23
26
27
28
29
1 Mile
5 000 Feet
Scale 1:15 840


50
N
1 Mile
5 000 Feet
Scale 1:15 840
R. 11 E.
R. 14 W.
(Joins sheet 42)
(Joins sheet 49)
(Joins sheet 58)
T. 12 N.
CLARK COUNTY
EDGAR COUNTY
East Fork


(Joins sheet 43)
R. 7 E.
T. 12 N.
MOULTRIE COUNTY
RAILROAD
RAILROAD
19
20
21
22
27
28
29
30
(Joins sheet 59)
N
1 Mile
5 000 Feet
Scale 1:15 840
0
¼
½
¾
1
0
1 000
2 000
3 000
4 000
5 000

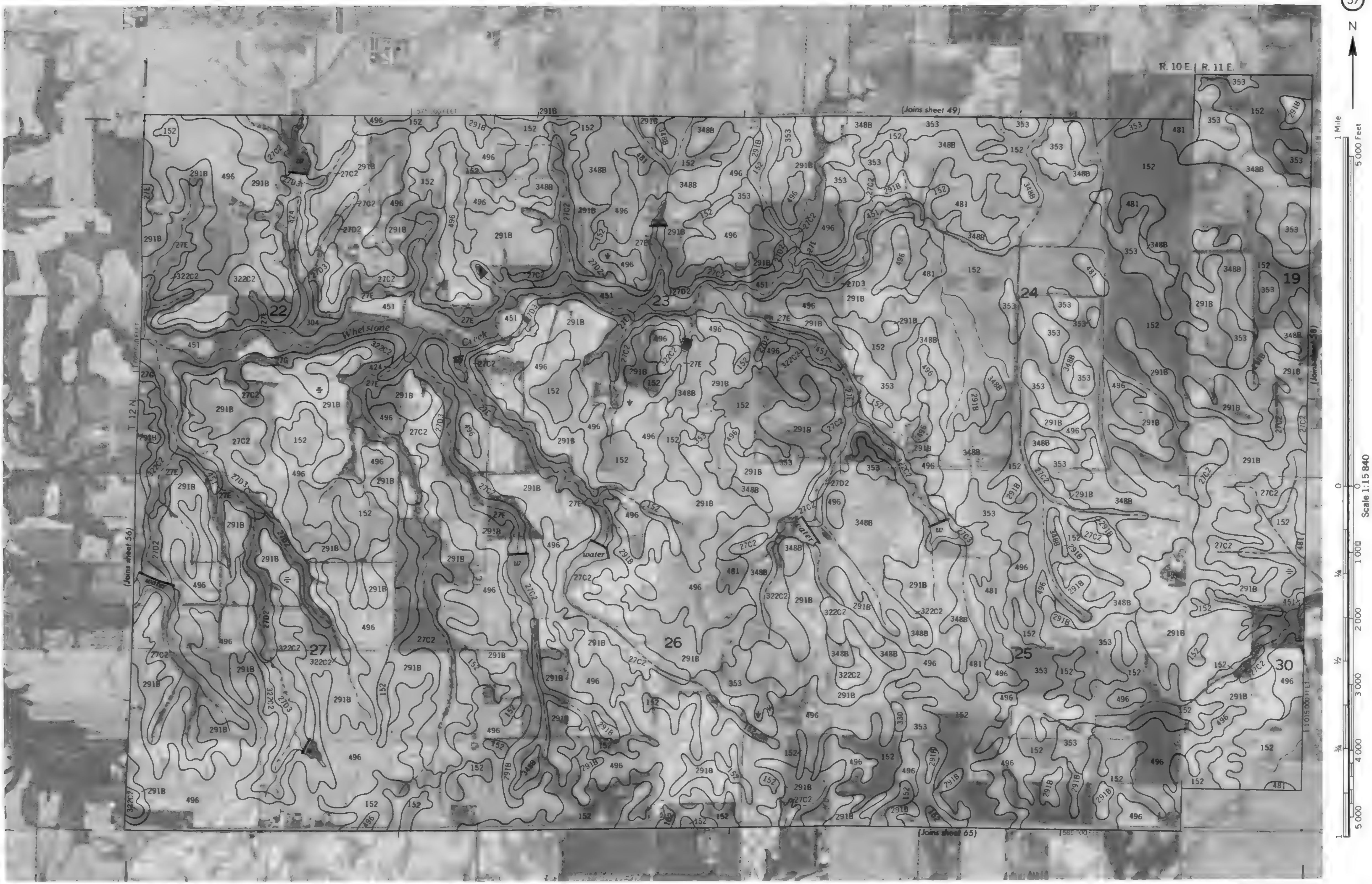

N
1 Mile
5 000 Feet
Scale 1:15 840
MATTOON
RAILROAD
(Joins sheet 51)
(Joins sheet 53)
(Joins sheet 60)
T 12 N
19
22
23
24
25
26
27
30

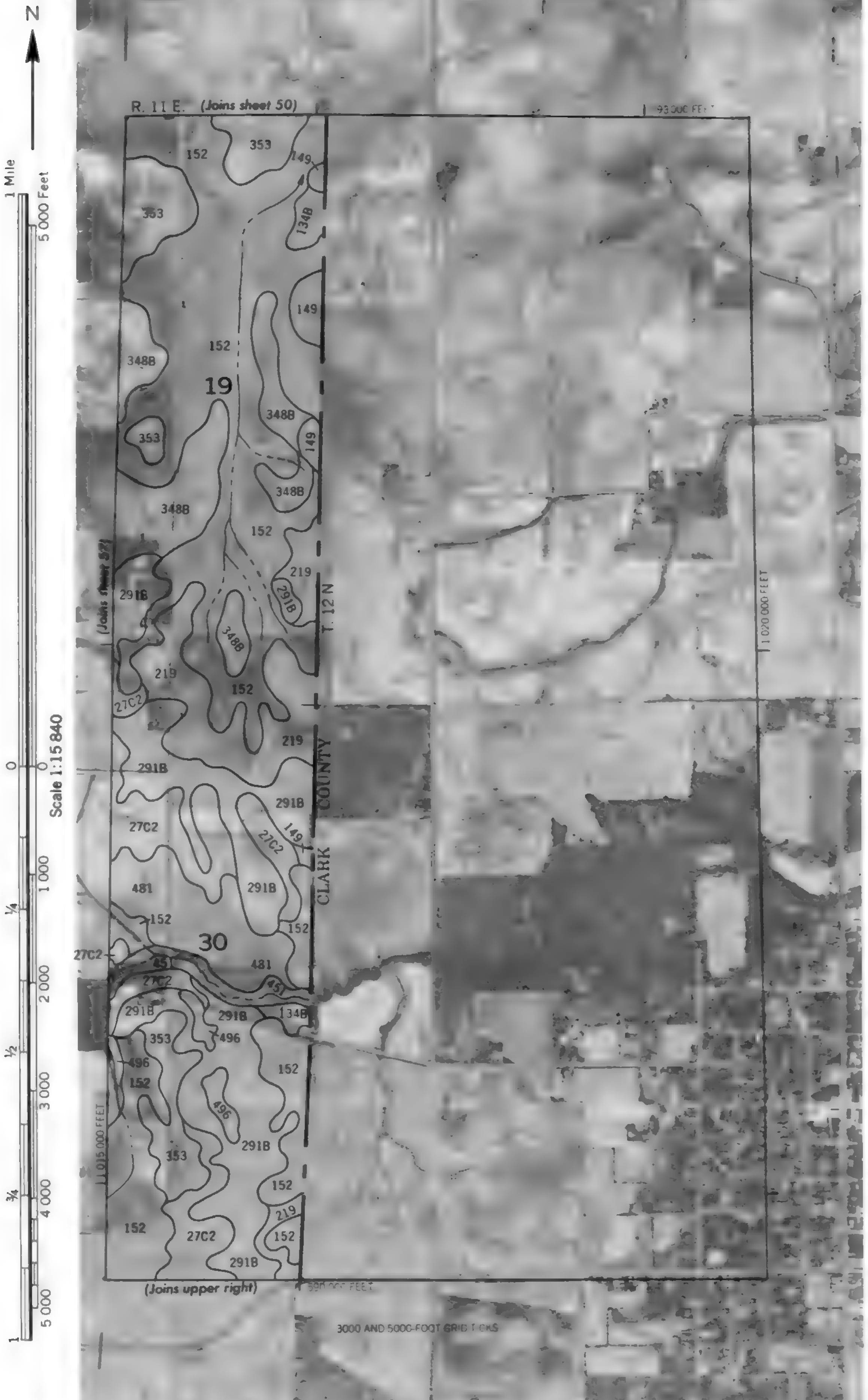

53
N
(Joins sheet 45)
(Joins sheet 52)
(Joins sheet 54)
(Joins sheet 61)
R 8 E.
T. 12 N.
COLES COUNTY MEMORIAL AIRPORT
Kickapoo Creek
RAILROAD
Janes
Scale 1:15 840
1 Mile
5 000 Feet


N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 46)
(Joins sheet 62)
(Joins sheet 53)
(Joins sheet 55)
R 8 E
R 9 E
COLES COUNTY MEMORIAL AIRPORT
23
24
19
20
26
25
30
29
Creek
RAILROAD


55
N
CHARLESTON
(County seat)
R. 9 E.
T. 12 N.
(Joins sheet 47)
(Joins sheet 63)
(Joins sheet 54)
LAKE CHARLESTON
EMBARRAS RIVER
Kickapoo Creek
Riley Creek
RAILROAD
21
22
23
24
25
26
27
28
1 Mile
5 000 Feet
Scale 1:15 840

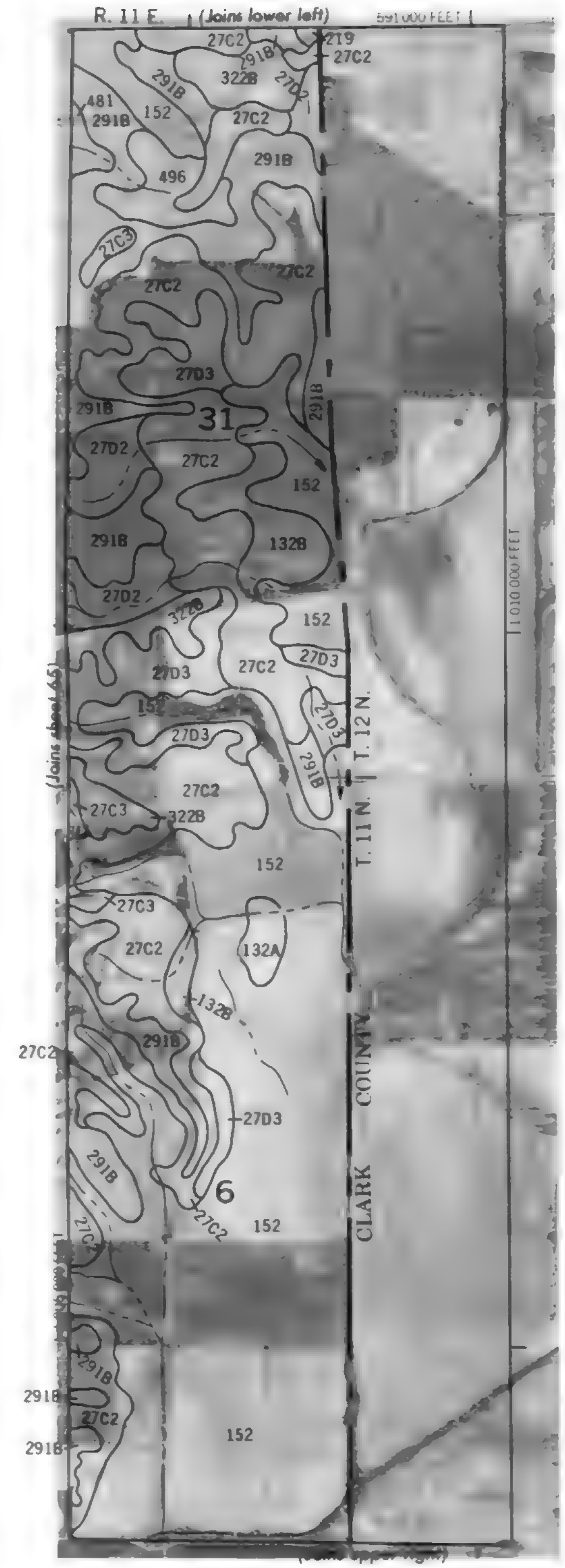

56
N
1 Mile
5 000 Feet
Scale 1:15 840
R 9 E.
R. 10 E.
(Joins sheet 48)
(Joins sheet 55)
(Joins sheet 64)
LAKE
CHARLESTON
EMBARRAS
RIVER
Whetstone
Creek
24
19
20
21
25
30
29
28


57
N
R. 10 E. | R. 11 E.
T. 12 N.
(Joins sheet 49)
(Joins sheet 65)
(Joins sheet 56)
(Joins sheet 58)
Whetstone Creek
22
23
24
19
25
26
27
30
water
1 Mile
5 000 Feet
Scale 1:15 840
0
1/4
1/2
3/4
1
1 000
2 000
3 000
4 000
5 000



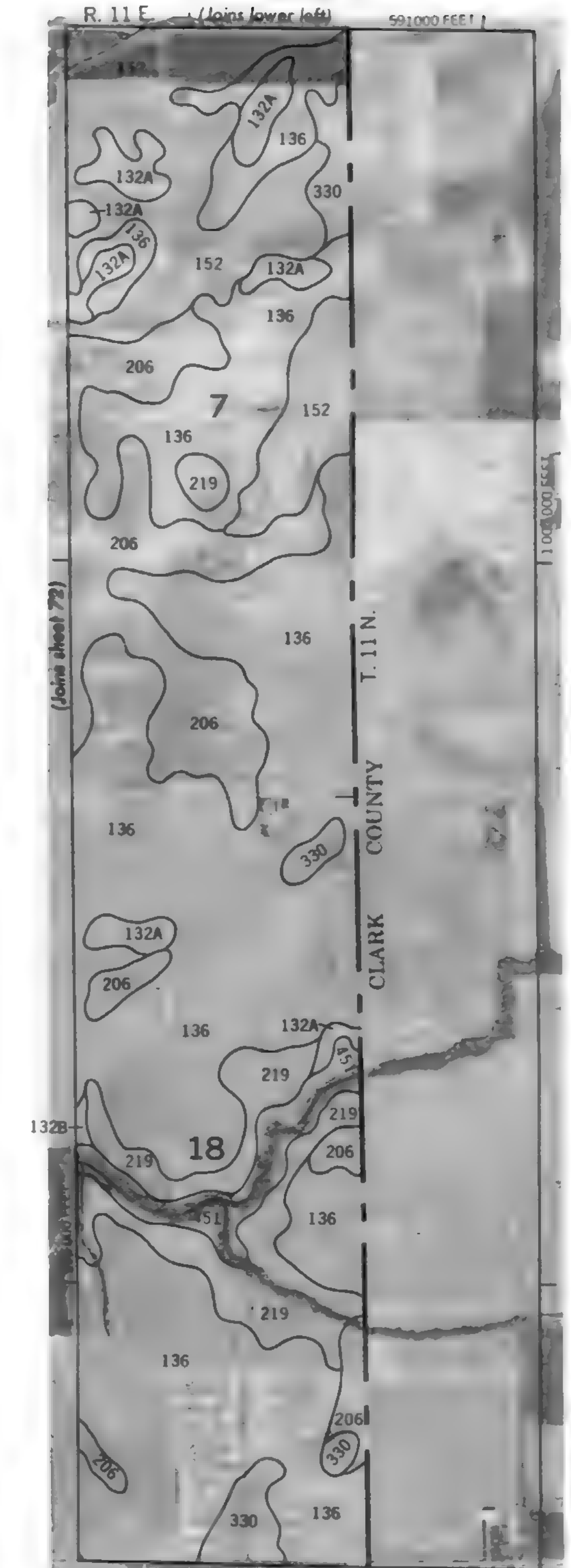
3000 AND 5000-FOOT GRID TICKS

INSET A

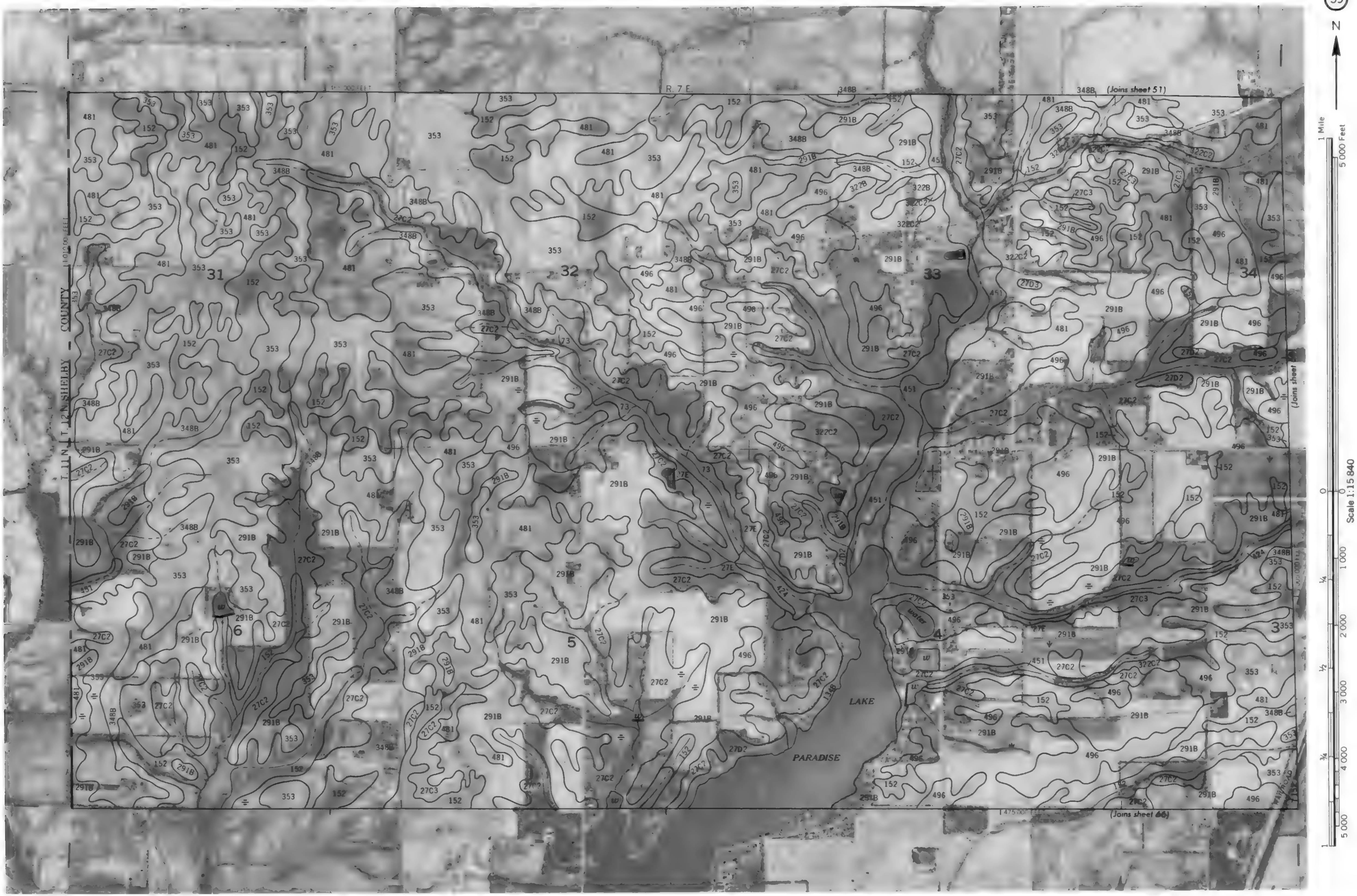


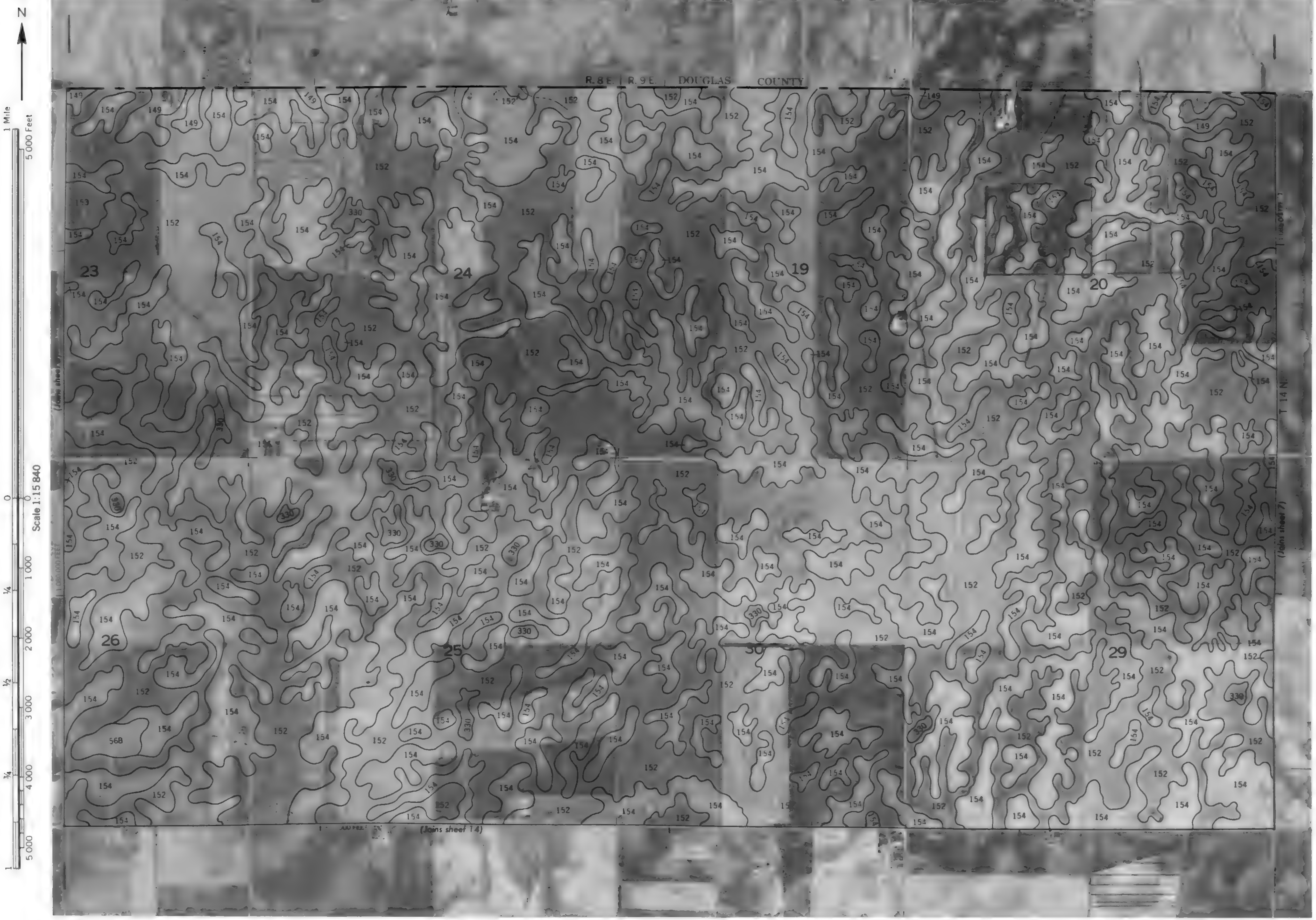
2000 AND 5000-FOOT GRID TICKS

INSET B



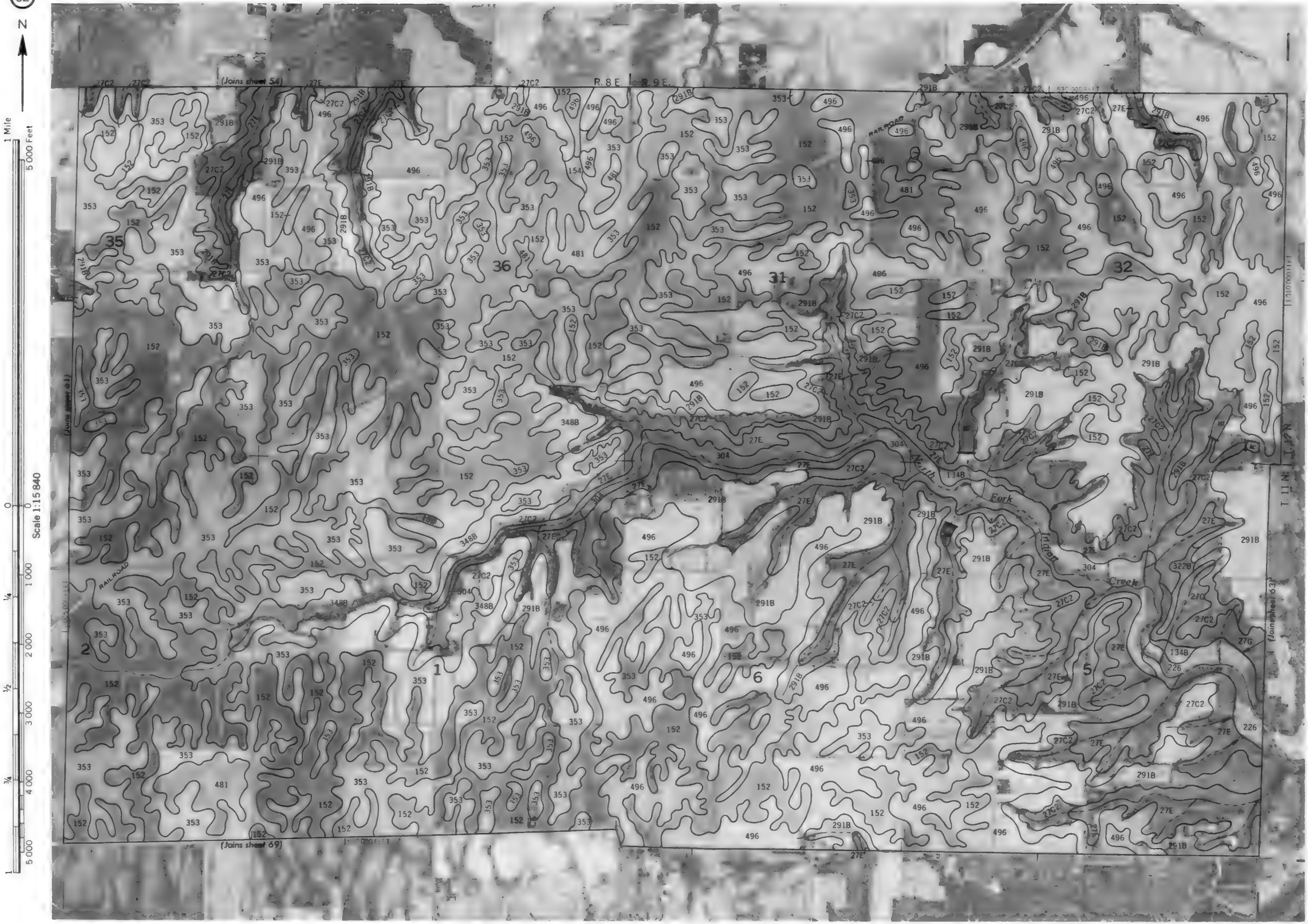
2000 AND 5000-FOOT GRID TICKS


59
N
R. 7 E.
(Joins sheet 51)
T. 11 N. | T. 12 N.
SHELBY COUNTY
31
32
33
34
6
5
4
3
PARADISE
LAKE
water
(Joins sheet
1 Mile
5 000 Feet
Scale 1:15 840

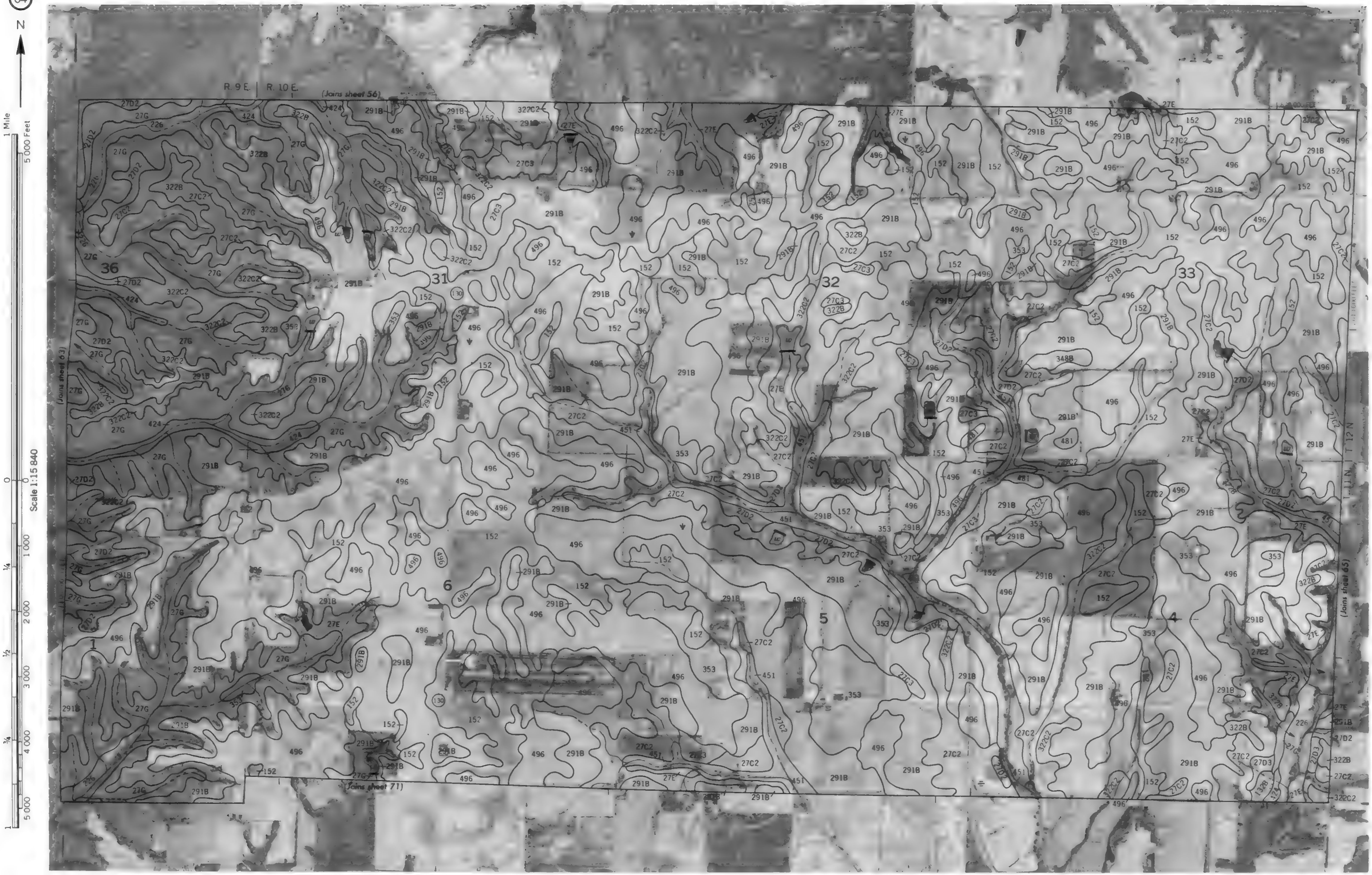

N
1 Mile
5 000 Feet
Scale 1:15 840
R.8 E. | R.9 E. DOUGLAS COUNTY
T 14 N.
(Joins sheet 7)
(Joins sheet 14)
23
24
19
20
26
25
30
29

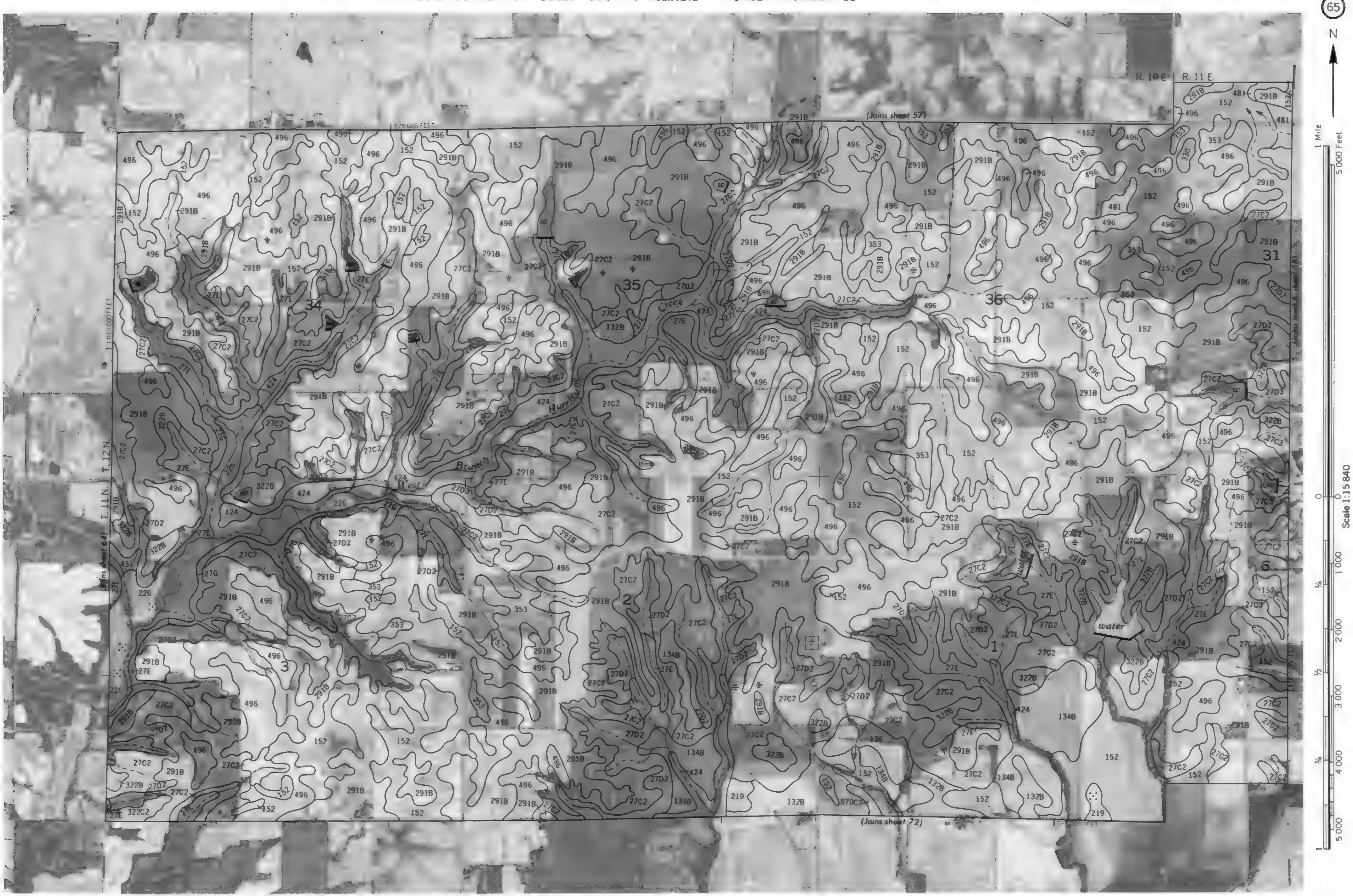

N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 52)
(Joins sheet 67)
(Joins sheet 61)
R.7 E.
R.8 E.
T.12 N.
T.11 N.
RAILROAD
LAKE LAND
JUNIOR
COLLEGE
533
34
35
36
31
1
2
3
6


N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 58)
(Joins sheet 60)
(Joins sheet 62)
(Joins sheet 68)
R. 8 E.
T. 12 N.
500 000 FEET
1 210 000 FEET
Newby
Creek
ROAD
RAILROAD
32
33
34
35
2
3
4
5
152
153
291B
27C2
27D3
27E
322C2
330
348B
353
481
496
56B
56B2

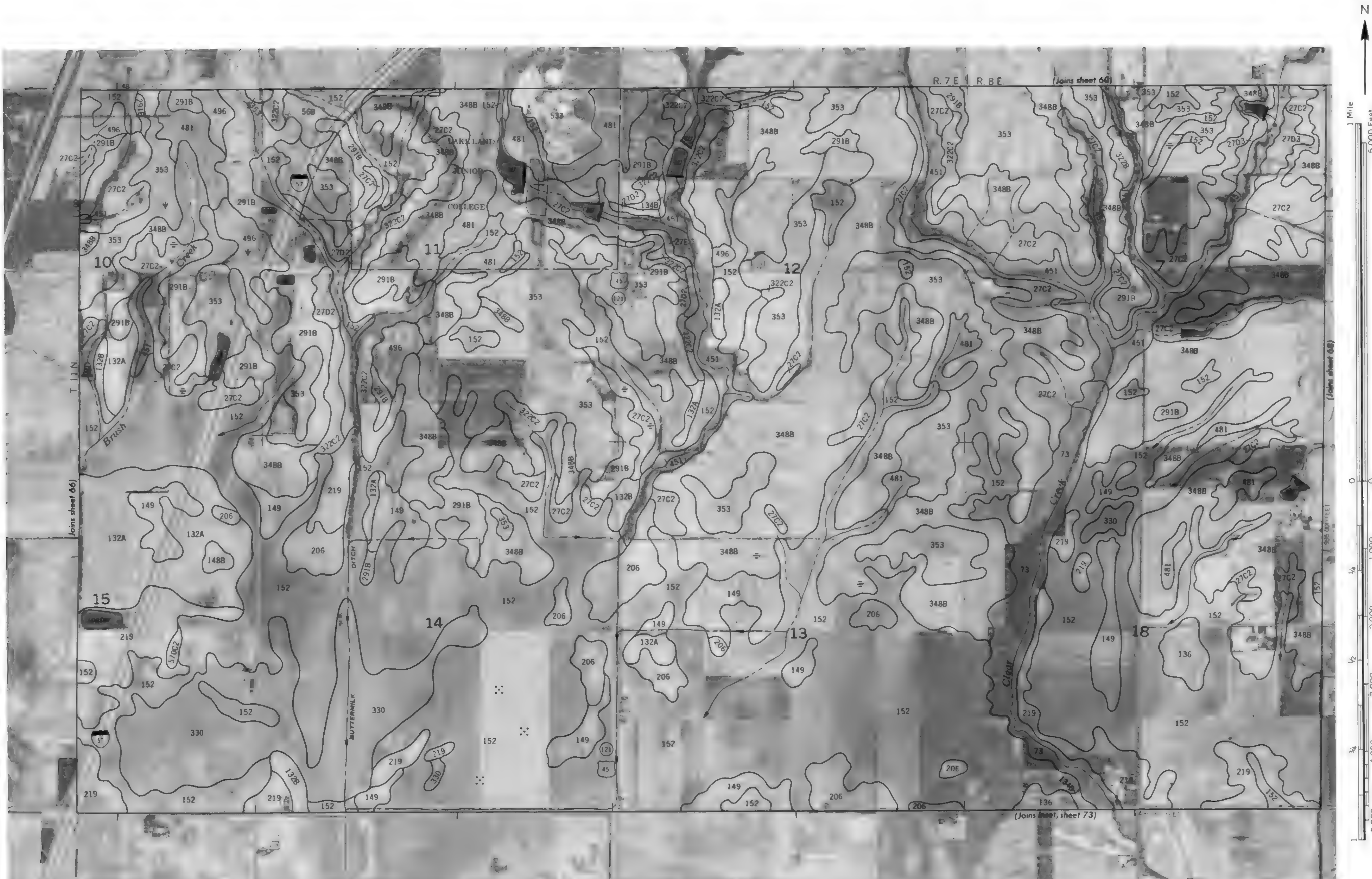

N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 54)
(Joins sheet 69)
(Joins sheet 61)
(Joins sheet 63)
R. 8 E.
R. 9 E.
T. 12 N.
T. 11 N.
RAILROAD
North Fork
Indian Creek
35
36
31
32
2
1
6
5

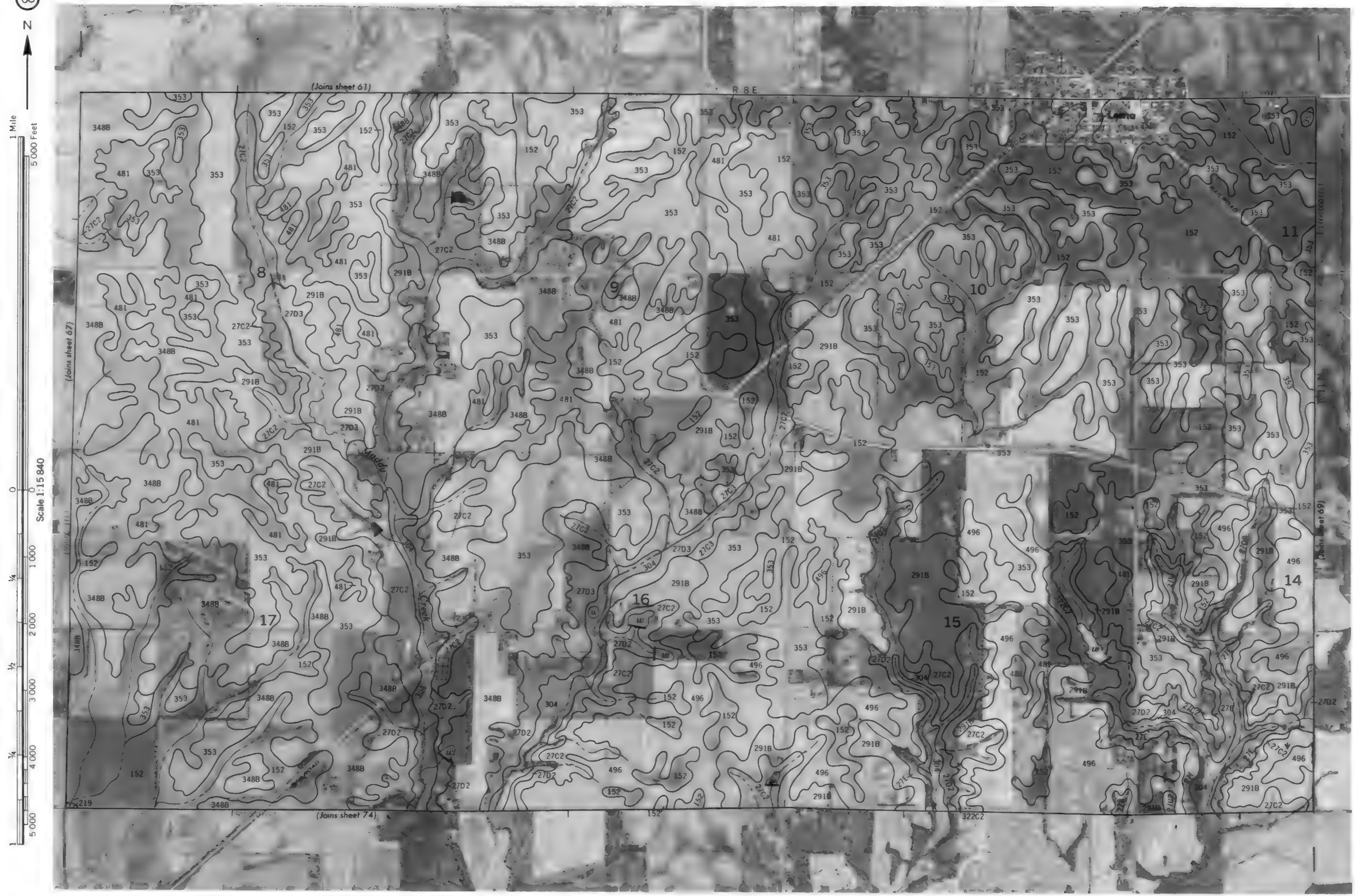

63
N
R 9 E
(Joins sheet 55)
(Joins sheet 62)
(Joins sheet 70)
T 11 N | T 12 N
33
34
35
36
Kickapoo
Creek
EMBARRAS
RIVER
Indian
1 Mile
5 000 Feet
Scale 1:15 840

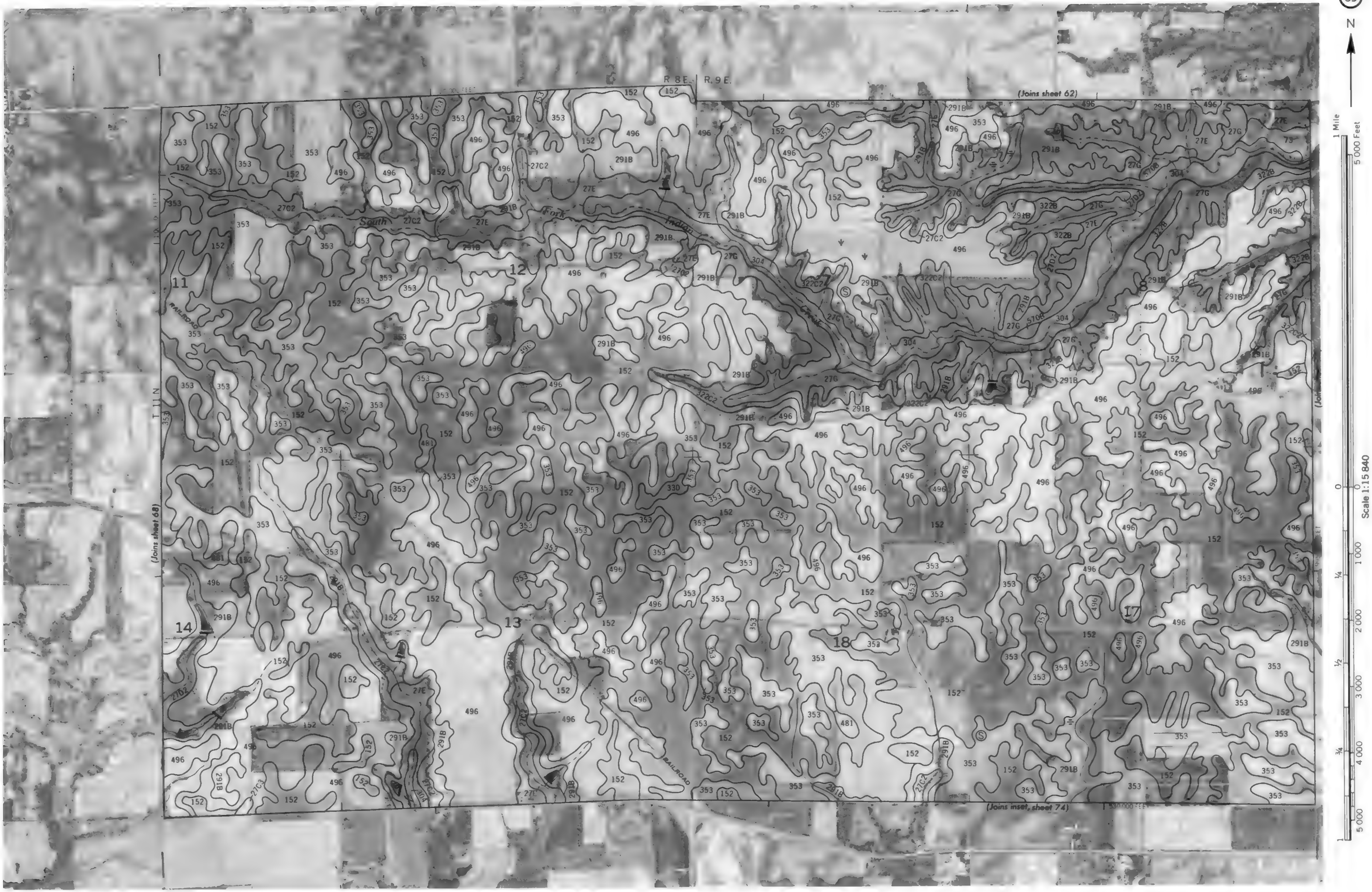

N
1 Mile
5 000 Feet
Scale 1:15 840
R. 9 E. | R. 10 E.
(Joins sheet 56)
(Joins sheet 63)
(Joins sheet 65)
(Joins sheet 71)
T. 12 N.
36
31
32
33
1
6
5
4

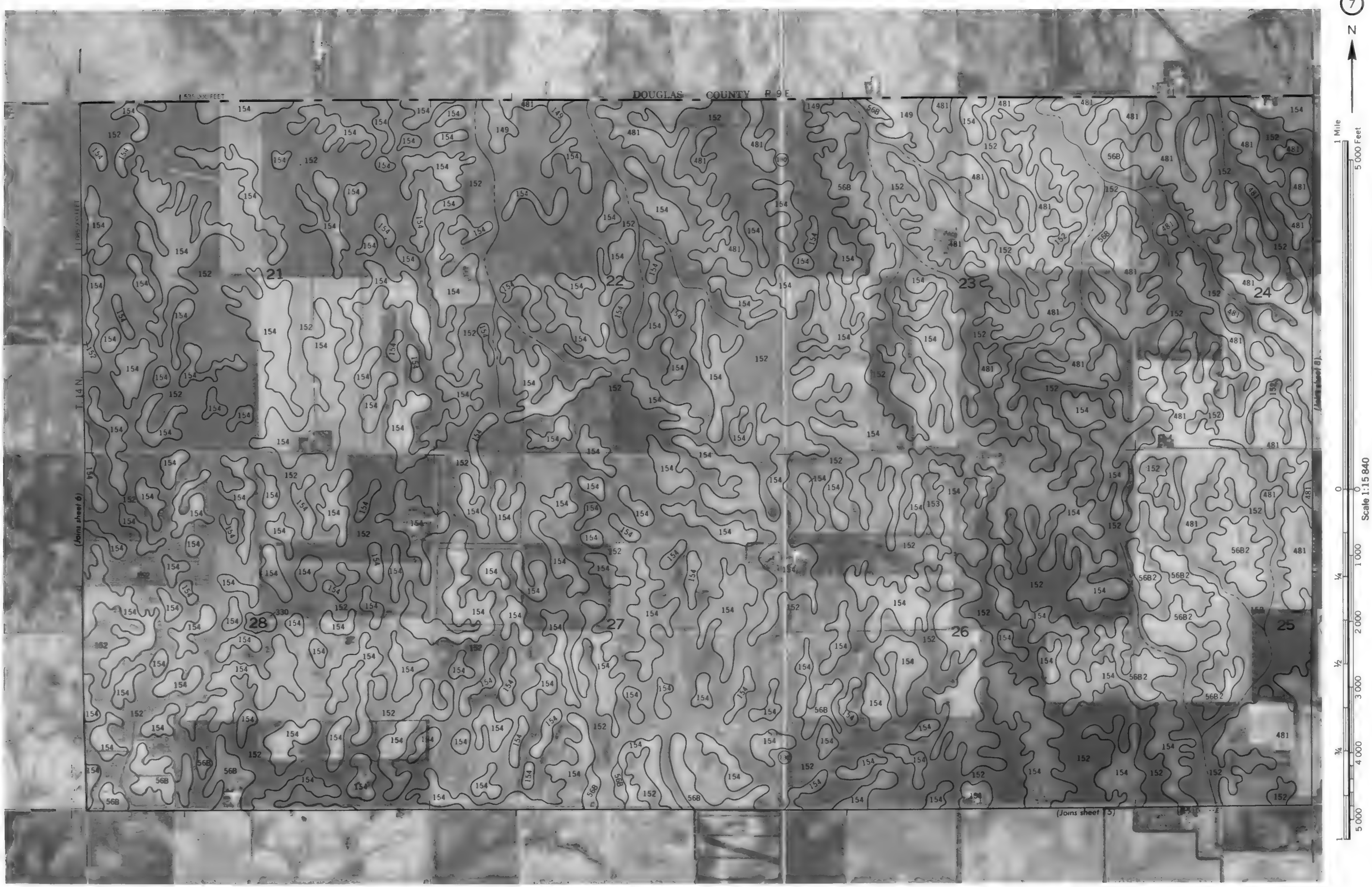

65
N
(Joins sheet 57)
(Joins sheet 72)
R. 10 E.
R. 11 E.
T. 11 N.
T. 12 N.
West Branch
Hurricane Creek
water
34
35
36
31
1
2
3
6
1 Mile
5 000 Feet
Scale 1:15 840
0
1/4
1/2
3/4
1
1 000
2 000
3 000
4 000
5 000
0

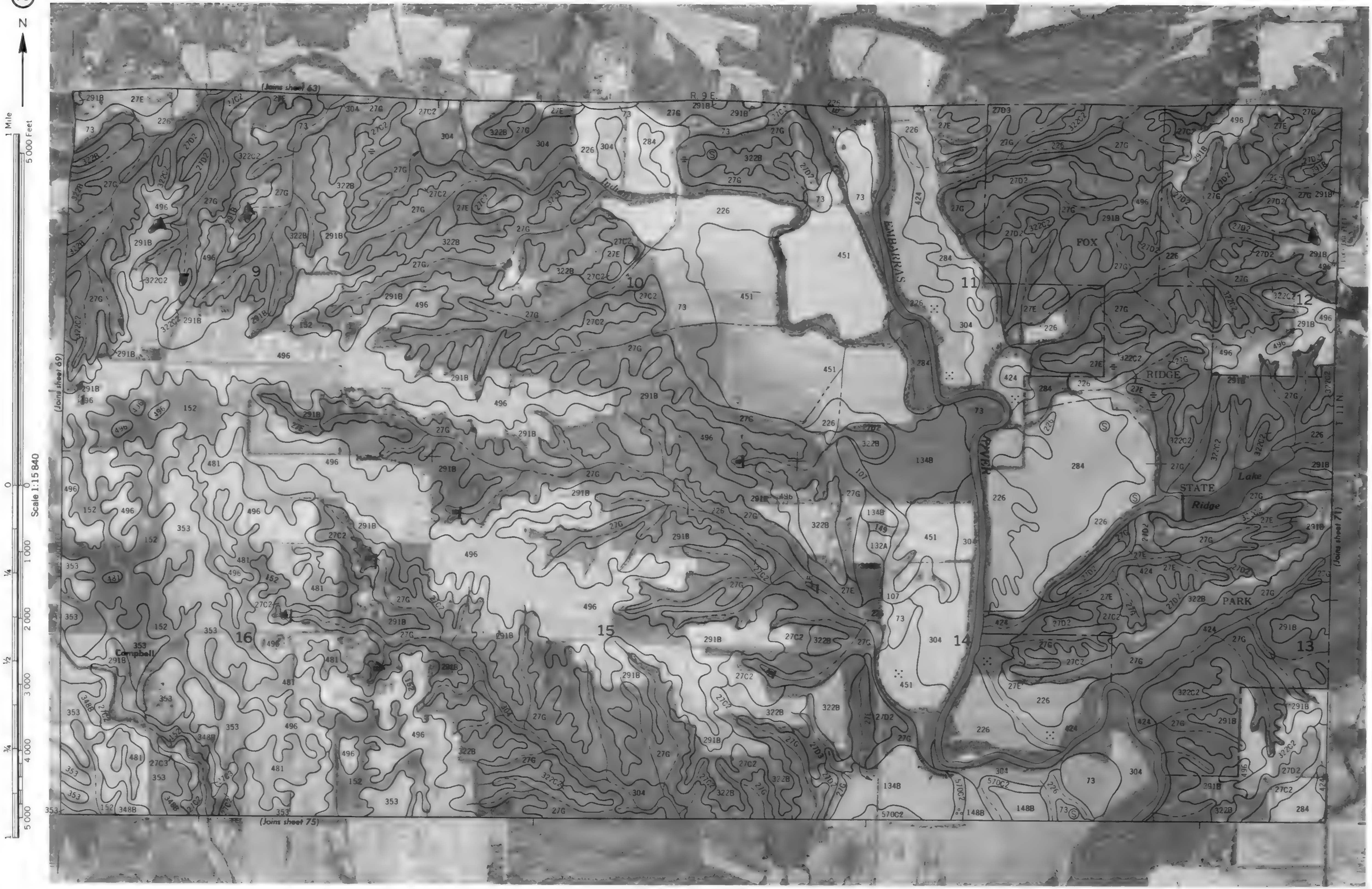

N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 59)
R.7 E.
PARADISE
LAKE
Paradise
Clear
Creek
SHELBY
COUNTY
Little
Wabash
River
Brush
Creek
RAILROAD
Etna
water
T. 11 N.
(Joins sheet 67)
(Joins sheet 73)


N
R. 7 E. | R. 8 E.
(Joins sheet 60)
(Joins sheet 66)
(Joins sheet 68)
(Joins inset, sheet 73)
T. 11 N.
LAKE LAND
JUNIOR
COLLEGE
Brush Creek
BUTTERMILK DITCH
Cigar Creek
10
11
12
7
15
14
13
18
1 Mile
5 000 Feet
Scale 1:15 840
0
1 000
2 000
3 000
4 000
5 000
1/4
1/2
3/4
1


N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 61)
(Joins sheet 67)
(Joins sheet 69)
(Joins sheet 74)
R 8 E
Muddy Creek
Loxa
RAILROAD
8
9
10
11
14
15
16
17


N
(Joins sheet 62)
(Joins sheet 68)
(Joins inset, sheet 74)
R. 8 E. | R. 9 E.
South Fork Indian Creek
RAILROAD
1 Mile
5 000 Feet
Scale 1:15 840
0
1000
2000
3000
4000
5000
¼
½
¾


7
N
DOUGLAS COUNTY R 9 E
T 14 N
(Joins sheet 6)
(Joins sheet 8)
(Joins sheet 15)
21
22
23
24
25
26
27
28
1 Mile
5 000 Feet
0
1 000
2 000
3 000
4 000
5 000
¼
½
¾
Scale 1:15 840


N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 63)
(Joins sheet 69)
(Joins sheet 71)
(Joins sheet 75)
R. 9 E.
T. 11 N.
EMBARRAS
RIVER
FOX
RIDGE
STATE
PARK
Lake
Ridge
Campbell
Indian
9
10
11
12
13
14
15
16


(Joins sheet 64)
(Joins inset, sheet 75)
(Joins sheet 70)
R.9E.
R.10E.
FOX
RIDGE
STATE
PARK
12
13
18
17
16
8
9
N
1 Mile
5 000 Feet
Scale 1:15 840
0
1 000
2 000
3 000
4 000
5 000
¼
½
¾
1
0

N

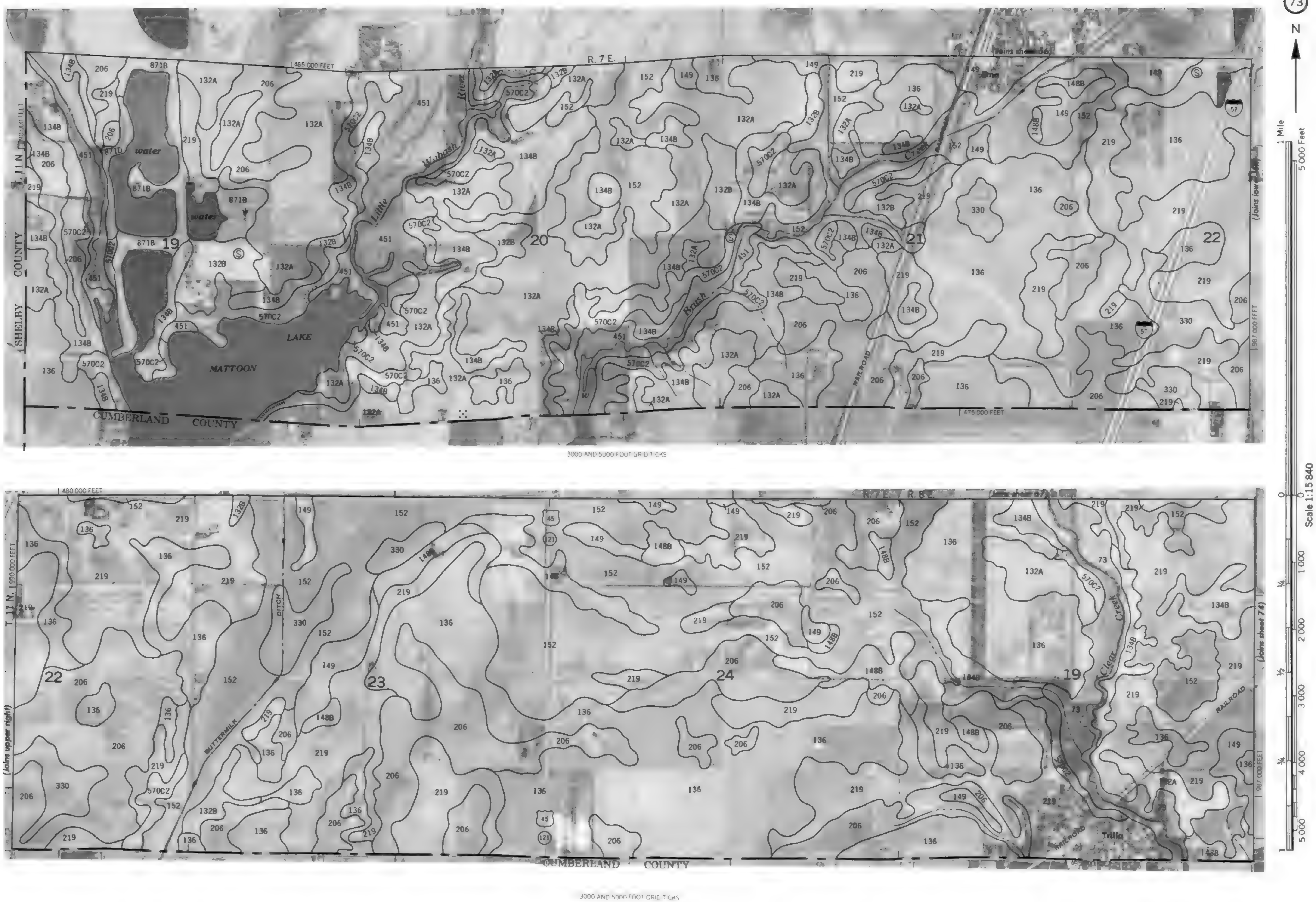
1 Mile

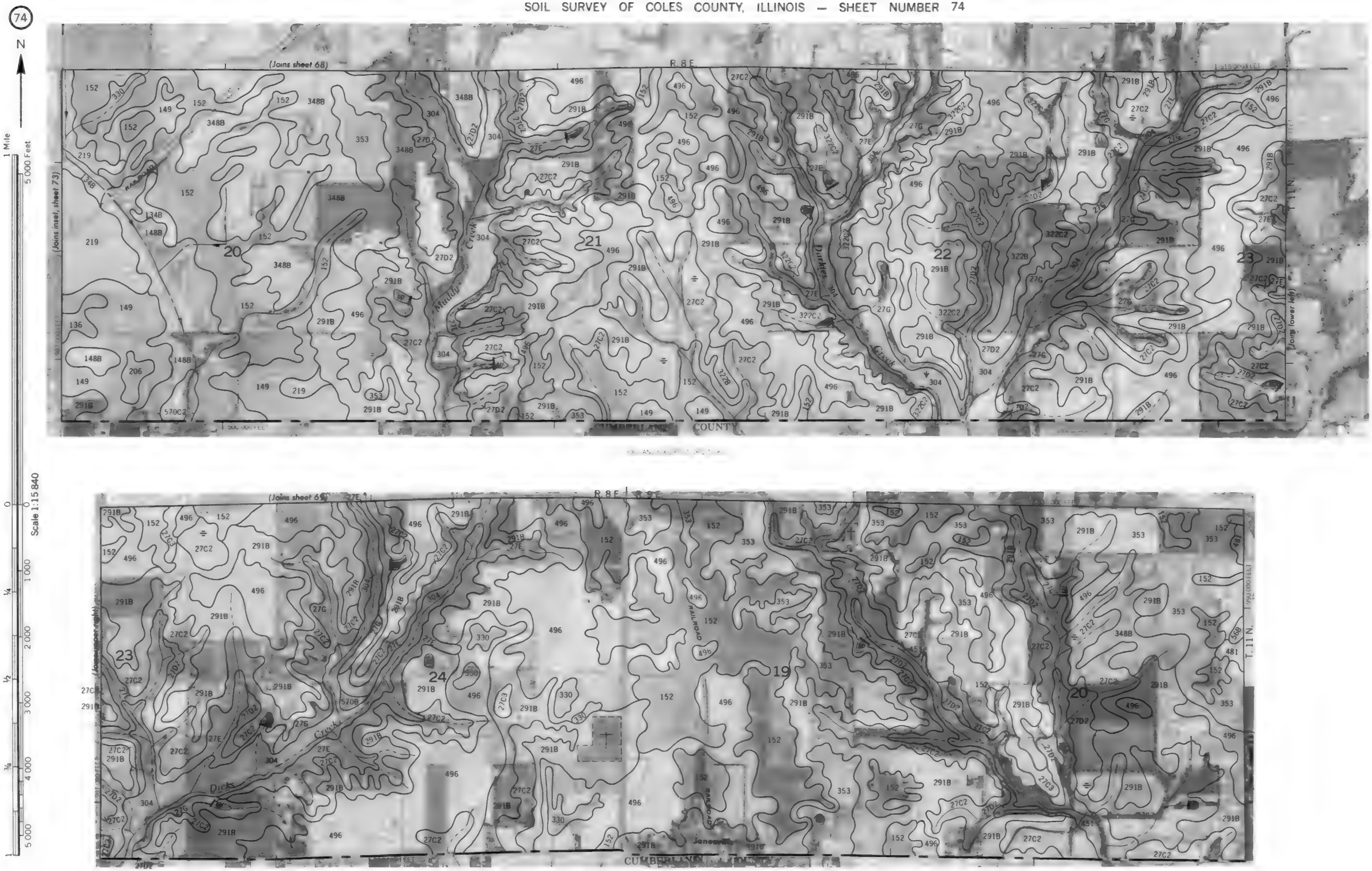
5 000 Feet

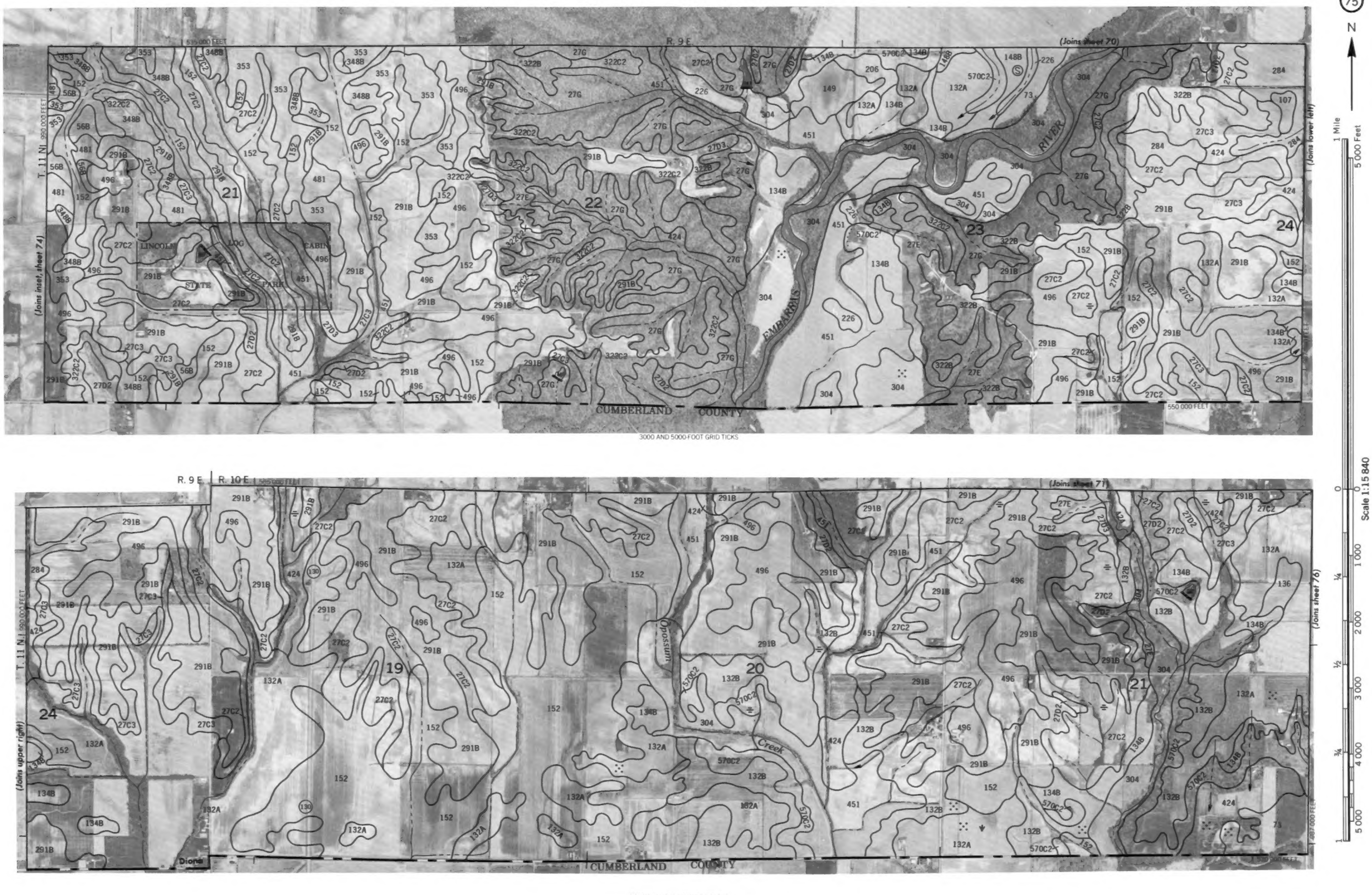
Scale 1:15 840

0 ¼ ½ ¾ 1

1 000 2 000 3 000 4 000 5 000

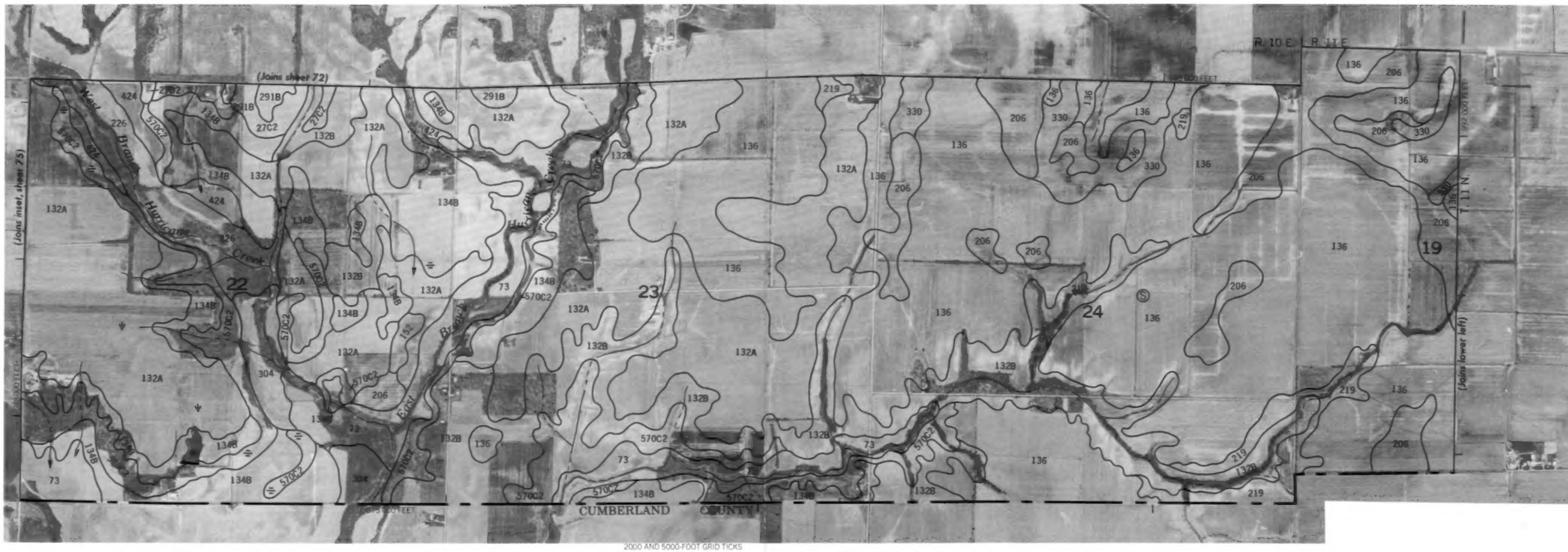

73
N
R. 7 E.
465 000 FEET
T. 11 N.
SHELBY COUNTY
CUMBERLAND COUNTY
water
LAKE
MATTOON
Little Wabash River
Brush Creek
RAILROAD
(Joins sheet 56)
(Joins lower left)
475 000 FEET
987 000 FEET
3000 AND 5000 FOOT GRID TICKS
480 000 FEET
990 000 FEET
R. 7 E. R. 8 E.
(Joins sheet 67)
(Joins upper right)
(Joins sheet 74)
DITCH
BUTTERMILK
Clear Creek
Trilla
1 Mile
5 000 Feet
Scale 1:15 840
19
20
21
22
23
24
45
121
57

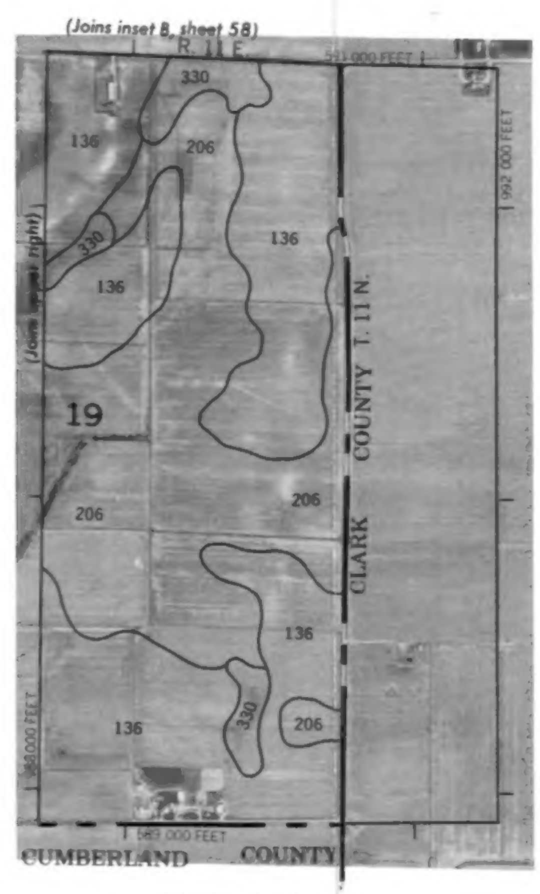

74
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 68)
(Joins sheet 69)
R. 8 E.
T. 11 N.
(Joins inset, sheet 73)
(Joins lower left)
Muddy Creek
Creek
Dicks
RAILROAD
Janesville
CUMBERLAND COUNTY
20
21
22
23
24
19


75
N
R. 9 E.
(Joins sheet 70)
T. 11 N.
(Joins inset, sheet 74)
(Joins lower left)
LINCOLN LOG CABIN STATE PARK
EMBARRAS RIVER
21
22
23
24
CUMBERLAND COUNTY
3000 AND 5000-FOOT GRID TICKS
R. 9 E.
R. 10 E.
(Joins sheet 71)
(Joins upper right)
(Joins sheet 76)
Opossum Creek
Diona
19
20
21
24
CUMBERLAND COUNTY
3000 AND 5000-FOOT GRID TICKS
1 Mile
5 000 Feet
Scale 1:15 840
0
¼
½
¾
1
1 000
2 000
3 000
4 000
5 000

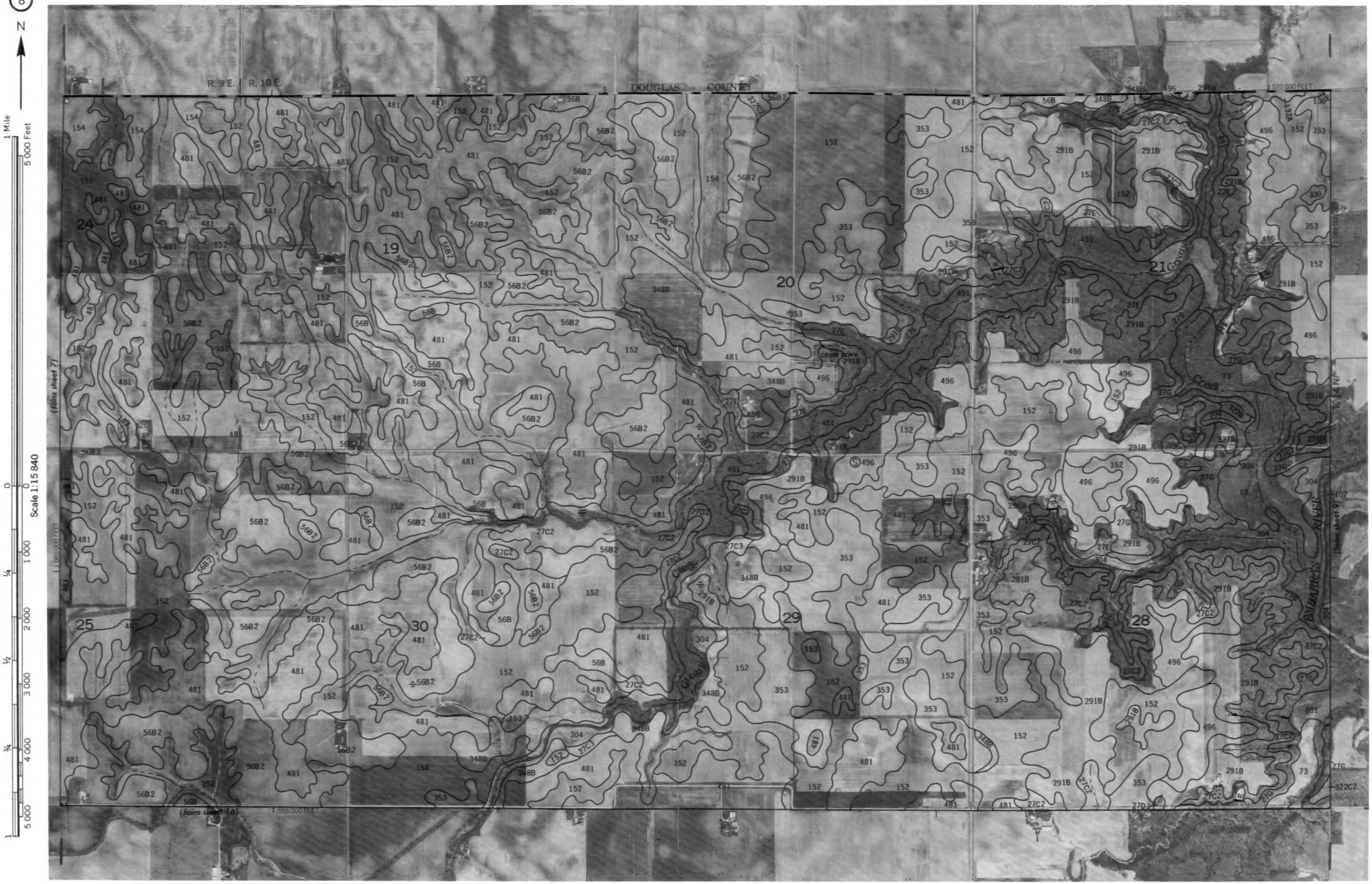
76

SOIL SURVEY OF COLES COUNTY, ILLINOIS — SHEET NUMBER 76





SOIL SURVEY OF COLES COUNTY, ILLINOIS — SHEET NUMBER 8



SOIL SURVEY OF COLES COUNTY, ILLINOIS — SHEET NUMBER 9